

# LAN

LAN ASSOCIATES

ENGINEERING ▪ PLANNING ▪ ARCHITECTURE ▪ SURVEYING, LLP

252 MAIN STREET, GOSHEN, NY 10924

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**CONTRACT DOCUMENTS  
AND  
TECHNICAL SPECIFICATIONS  
FOR  
PHYSICAL EDUCATION DEPARTMENT RENOVATIONS  
AT  
WESTLAKE HIGH SCHOOL  
AT  
825 WEST LAKE DRIVE  
THORNWOOD, NY 10594  
NYSED #66-08-01-06-0-005-020**

Mount Pleasant Central School District  
825 West Lake Drive  
Thornwood, NY 10594

Telephone No. 914-769-5500

Contact: Dr. Kurtis Kotes,  
Superintendent of Schools

**LAN Job #4.1449.08**  
NYSED Submission: 7/9/20  
Issue to Bid: 11/20/20

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Michael J. McGovern, RA  
NY RA #022257

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SINCE 1965

ENGINEERING • PLANNING • ARCHITECTURE • SURVEYING, LLP  
252 MAIN STREET, GOSHEN, NEW YORK 10924  
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STATE OF NEW YORK - DEPARTMENT OF LABOR  
 ASBESTOS CERTIFICATE SECTION 000107 - SEALS N.Y.S



**ANTHONY N MELUSO**  
 CLASS(EXPIRES)  
 I PD (12/20)

CERT# 94-03914  
 DMV# 339815193

MUST BE CARRIED ON ASBESTOS PROJECTS




01213 005232525 57

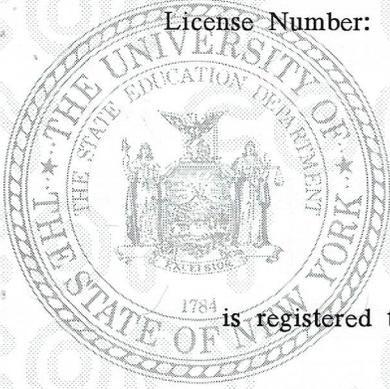
EYES BRO  
 HAIR BRO  
 HGT 5' 06"

IF FOUND RETURN TO:  
 NYSDOL - L&C UNIT  
 ROOM 161A BUILDING 12  
 STATE OFFICE CAMPUS  
 ALBANY NY 12240

SECTION 000107 - SEALS  
**The University of the State of New York**  
**Education Department**  
**Office of the Professions**  
**REGISTRATION CERTIFICATE**  
*Do not accept a copy of this certificate*

License Number: 067937-01

Certificate Number: 0717456



MELUSO ANTHONY N  
 61 FERRIS LANE  
 NEW PALTZ NY 12561-0000

is registered to practice in New York State through 11/30/2022 as a(n)  
**PROFESSIONAL ENGINEER**

LICENSEE/REGISTRANT

*Jane S. Blain*  
 EXECUTIVE SECRETARY

*Maryellen Elia*  
 COMMISSIONER OF EDUCATION

*De E. Hill*  
 DEPUTY COMMISSIONER  
 FOR THE PROFESSIONS

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12-006017472

This card acknowledges that the recipient has successfully completed:

**10-hour Construction Safety and Health**

This card issued to:

Anthony Meluso

David Veit

06/08/2016

Trainer Name

Date of Issue



732.235.9450  
aotc.sph.rutgers.edu

OSHA recommends Outreach Training Courses as an orientation to occupational safety and health for workers. Participation is voluntary. Workers must receive additional training on specific hazards of their job. This course completion card does not expire.

Use or distribution of this card for fraudulent purposes, including false claims of having received training, may result in prosecution under 18 U.S.C. 1001. Potential penalties include substantial criminal fines, imprisonment up to 5 years, or both.



To verify this training, scan the QR code with your mobile device.

Rev. 1/2016



SECTION 000115 – LIST OF DRAWINGS

1.1 LIST OF DRAWINGS

- A. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

LIST OF DRAWINGS  
(24" x 36" Not Bound in Specifications)

**PHYSICAL EDUCATION DEPARTMENT RENOVATIONS**

**AT WESTLAKE HIGH SCHOOL**

825 Westlake Drive  
Thornwood, NY 10594

<u>DRWG.</u> <u>NO.</u>	<u>TITLE</u>
C0.01	COVER SHEET
T0.01A	ARCHITECT TITLE SHEET & GENERAL NOTES
CA0.01	CODE ANALYSIS AND PHASING PLAN
CA0.02	EGRESS PLAN – BASEMENT
CA0.03	EGRESS PLAN – 1ST FLOOR SOUTH
CA0.04	EGRESS PLAN – 1ST FLOOR NORTH
CA0.05	EGRESS PLAN – 2ND FLOOR
ASB1.01	ASBESTOS REMOVAL PLAN
A1.00	DEMOLITION KEY NOTES
A1.01	(WEST) PARTIAL 1ST FLOOR PLAN W/DEMO
A1.02	REFLECTED CEILING PLAN WITH DEMOLITION
A1.03	PARTIAL ELEVATIONS – DEMOLITION
A2.01	PROP. PARTIAL (WEST) 1ST FLOOR PLAN
A2.02	PROP. PARTIAL (EAST) 1ST FLOOR PLAN
A2.03	PARTIAL PROPOSED ROOF PLAN
A3.01	PARTIAL ELEVATIONS
A4.01	PROPOSED BUILDING SECTION
A5.01	REFLECTED CEILING PLANS
A5.02	CEILING DETAILS
A6.01	PARTITION TYPES & FIRE EXTINGUISHER
A6.10	DOOR SCHEDULE & ELEVATIONS
A6.11	DOOR DETAILS
A6.12	WINDOW & INTERIOR FINISH SCHEDULES
A7.00	INTERIOR ELEVATION SCHEDULES & DETAILS AND ENLARGED LOCATION KEY PLANS
A7.01	ENLARGED FLOOR PLANS
A7.02	ENLARGED FLOOR PLANS
A7.03	INTERIOR ELEVATIONS
A7.04	INTERIOR ELEVATIONS
A7.05	INTERIOR ELEVATIONS
A8.01	FIRESTOPPING DETAILS
A9.01	PROPOSED FINISH PLANS

<u>DRWG.</u> <u>NO.</u>	<u>TITLE</u>
T0.01M	MECHANICAL TITLE SHEET
M0.01	MECH. GEN. NOTES, LEGEND & ABBREV.
M1.01	MECHANICAL DEMOLITION PLANS
M2.01	PARTIAL MECH. PROPOSED FLOOR PLANS
M2.02	PARTIAL MECH. PROPOSED ROOF PLAN
M6.01	MECHANICAL SCHEDULES
M6.02	MECHANICAL DETAILS
M6.03	MECH. DETAILS & VENTILATION SCHED.
T0.01P	PLUMBING TITLE SHEET & DRAWING INDEX
P1.01	PLUMBING DEMOLITION FLOOR PLANS
P2.01	PLUMBING PROPOSED FLOOR PLANS
P6.01	PLUMBING RISER SCHEMATICS
P6.02	SCHEDULES AND DETAILS
T0.01E	ELECTRICAL TITLE SHEET & DRAWING INDEX
E1.01	PARTIAL FIRST FLOOR DEMOLITION PLANS
E2.01	PARTIAL FIRST FLOOR POWER PLANS
E5.01	PARTIAL FIRST FLOOR LIGHTING PLANS
E7.01	EQUIPMENT SCHEDULES, NOTES & DETAILS

END OF SECTION 000115

## NOTICE TO BIDDERS

MOUNT PLEASANT CENTRAL SCHOOL DISTRICT  
**Physical Education Department Renovations at Westlake High School**  
(NYSSED #66-08-01-06-0-005-020)

PUBLIC NOTICE is hereby given that sealed bids shall be received by the Board of Education, Mount Pleasant Central School District, 825 Westlake Drive, Thornwood, NY 10594 for the

Physical Education Department Renovations at Westlake High School

Bid proposals shall be received by **Thursday, January 28, 2021** by mail or in person, at the Mount Pleasant Central School District Office, 825 Westlake Drive, Thornwood, NY 10594 until **3:00 p.m. (EST)**. Please note that the bids will be opened virtually. Staff will be available to accept hand delivered bids between the hours of 9:00 a.m. and 3:00 p.m. on **Thursday, January 28, 2021**.

**In light of the COVID-19 pandemic, in-person attendance to the bid opening will not be permitted. The bid opening will be recorded and streamed live online. A website address to view the bid opening live will be provided in an addendum to the bid documents.**

All envelopes containing bids shall bear on the face of the sealed envelope the words **“Insert Date”, Bid for Physical Education Department Renovations at Westlake High School**”. No Bids shall be accepted after **3:00 p.m. on Thursday, January 28, 2021**. USPS, UPS and FedEx delivery schedules are limited, so please allow enough time for your proposal to arrive on or before the due date and time.

The plans and specifications may be examined/obtained at REV Ventures, Inc., 330 Route 17A, Suite 3, Goshen, NY 10924, or at their website [www.usinglesspaper.com](http://www.usinglesspaper.com) or by phone (845) 651-3845 between 9:00 a.m. and 5:00 p.m. Monday through Friday beginning on **Monday, January 4, 2021**. A bid deposit of \$100 payable to Mount Pleasant Central School District by check or money order is required to obtain printed documents. The deposit is refundable if the bid documents are returned in good condition within 30 days after the bid date. Complete digital sets of Bidding Documents, drawings and specifications may also be viewed online with a free user account or downloaded for a non-refundable fee of Forty-Nine (\$49.00) dollars at [www.usinglesspaper.com](http://www.usinglesspaper.com) under public projects.

Please note that all bidders must obtain bid packages from REV Ventures, Inc. or at their website [www.usinglesspaper.com](http://www.usinglesspaper.com) in order to submit a bid for this project. REV Ventures, Inc. or their website [www.usinglesspaper.com](http://www.usinglesspaper.com) is the **ONLY** authorized distributor of the bid package and all bidders must be on their bidders list.

All bid addenda will be transmitted to registered plan holders via email and will be available at [www.usinglesspaper.com](http://www.usinglesspaper.com). Plan holders who have paid for hard copies of the bid documents will need to make the determination if hard copies of the addenda are required for their use, and coordinate directly with Rev. Ventures Inc. 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.

All technical questions, comments, and inquiries should be directed to LAN (Attention Mr. Matthew Milnamow, AIA at telephone number 845-615-0350, fax number 845-615-0351 or email [matthew.milnamow@lanassociates.com](mailto:matthew.milnamow@lanassociates.com)).

There will be a **virtual pre-bid conference on Tuesday, January 19, 2021 at 3:00 p.m.** at the Mount Pleasant Central School District, High School 825 West Lake Drive, Thornwood, NY 10594. Bidders are urged to attend the pre-bid conference. Knowledge of the project is crucial to obtain a proper understanding of the Work. **A Zoom link will be provided in an addendum to the bid documents.**

There will be a **pre-scheduled site walkthrough on Wednesday, January 20, 2021 from 2:30 p.m. to 4:30 p.m. by appointment only.** Please contact Frank Roberts of Arris Construction Company at 914-755-0930 to schedule a site visit and walkthrough of the building.

**In light of the COVID-19 pandemic, protocols – including sign-in procedures and mandatory wearing of masks – will be in place (those not wearing masks will not be granted access). Bidders will be granted access in small groups to maintain social distancing.**

All laborers, workers and mechanics working on the site of this project must be certified as having successfully completed the OSHA 10-hour construction safety and health course.

No bidder shall withdraw his bid within sixty (60) days after the formal bid opening. The Board of Education reserves the right to waive any informality in any proposals, or to reject any or all proposals and to advertise for new proposals.

Dated:

By Order of: Board of Education  
Mount Pleasant Central School District  
Thornwood, NY 10594

## SECTION 002113 – INSTRUCTIONS TO BIDDERS

1.0 Opening of Bids: Bids will be opened at the time and place set for in the Advertisement for Bids. Every bid received before that time, or authorized postponement thereof, will be opened and publicly read aloud. Bidders and other persons properly interested may be present in person or by representative.

The Owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof or may waive any informalities in or reject any or all bids. Any bid may be withdrawn prior to the advertised time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid within sixty (60) days after the actual opening thereof.

Conditional bids will not be accepted.

2.0 Bidding Documents: The bidding documents include the Advertisement for Bids, Instruction to Bidders, Form of Proposal, General Conditions, Supplementary General Conditions, Division 1 - General Requirements, Specifications, Drawings, and all Addenda issued prior to the opening of bids.

3.0 Preparation of Proposal: Proposals must be submitted on prescribed forms or facsimiles thereof. All blank spaces must be filled in, in ink or typewritten, in figures where so indicated.

Note - All contractors, this project is to be bid, the contracts drawn and payments made in such a manner that Sales and Compensating Use Taxes of the State of New York and of cities and counties will not apply to purchases and sales of materials and supplies.

Note - Contractor shall note that whenever brand names or specific product systems are indicated, it shall be clearly understood that such identification is for the purpose of illustrating the type of product and the degree of quality desired. Such identification in no way precludes the contractor from using products of other manufacturers which can be shown in advance to be of like kind and of equal quality under the provisions of New York State Equivalency Clause.

Your attention is directed to Article 11 of the Instructions to Bidders and Article 15 of the Supplementary General Conditions.

All envelopes containing bids shall bear on the face of the sealed envelope the words "Education Department Renovations at Westlake High School". Each proposal must be submitted in a sealed envelope and shall have clearly designated on the outside the name and address of the bidder, the name of the project, and the contract for which proposal is submitted.

4.0 Non-Collusive Bidding Certificate: Each prime bidder submitting a bid for any portion of the work contemplated by the bidding documents shall execute a non-collusive certificate as required by applicable New York State law, in the form herein provided, to the effect that he has not colluded with any other person, firm, or corporation in regard to any bid submitted. Such certificate shall be attached to the bid. Failure of any bidder to abide by this provision shall be caused for rejection of his bid.

5.0 Qualification of Bidders: The Owner may make such investigation as he deems necessary to determine the ability of the bidder to perform the work and the bidder shall furnish to the Owner all information and data for this purpose as the Owner may request. The Owner reserves the right, in its sole discretion, 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 herein within the time limit agreed upon. The ability of any bidder to secure bid, performance and payment bonds shall not be the sole method of determining the bidder to be qualified.

The bidder must intend to complete at least 25 percent of the work with its own work force. General Conditions, mobilization, etc. shall not count toward the 25 percent requirement. The bidder must complete Qualification Statement Form.

6.0 Bid Security: Each proposal shall be accompanied by a bid bond or certified check. The choice of security to be at the option of the Contractor.

Bid security shall be in amounts as follows:

1. Bid Bond shall be in the amount of 10% of the base bid and shall be on AIA Form A310. It shall be duly executed by the bidder as principal, having as surety thereon a surety company approved by the Owner.
2. Certified checks shall be in the amount of 10% of the base bid.

The aforementioned bid security will be returned to all except the two (2) lowest formal bidders within three (3) days after the formal opening of the proposals. The remaining security will be returned to the two (2) lowest bidders within 48 hours after the Owner and the accepted bidder have executed the contract, or, if no contract has been so executed, within sixty (60) days after the formal bid opening so long as the bidder has not been notified of the acceptance of his proposal.

7.0 Liquidated Damages for Failure to Enter Into Contract: A successful bidder, upon his failure or refusal to execute and deliver the Contract and bonds required within ten (10) days after he has received notice of the acceptance of his proposal, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with his proposal. Bidder acknowledges that its bid is an offer to contract and that the Owner's award of the contract is acceptance of that offer, thereby created a binding agreement.

8.0 Subcontractors and Material Suppliers: The successful bidder for each Contract shall submit to the Architect/Engineer within ten (10) calendar days after receipt of notification of award of contract, on the form supplied, a list of subcontractors, material suppliers, and manufacturers proposed for the various portions of the work.

9.0 Conditions of Work: Each bidder must inform himself fully of the conditions relating to the construction and labor under which the work is now being or will be performed. Failure to do so will not relieve a successful bidder of his obligations to furnish all material and labor necessary to carry out the provisions of the contract documents and to complete the contemplated work for the consideration set forth in his bid. The Contractor in the carrying out of his work must employ such methods or means as will not cause any interruption or interference with the work of any other contractor, or the operations of the Owner.

10.0 Obligations of Bidders and Mandatory Site Inspections: At the time of the opening of bids, each bidder will be presumed to have inspected the site, to have familiarized himself with local conditions, and to have read and to be thoroughly familiar with the bidding documents, including all addenda. The failure or omission of any bidder to receive or examine any form, instrument or document shall in no way relieve any bidder from any obligation in respect to his bid.

11.0 Assessments and Taxes:

1. Exemptions from Sales Tax: The Sales and Compensating Use Taxes of the State of New York and the cities and counties do not apply to purchases and sales of materials and supplies pursuant to the provisions of this contract. These taxes are not to be included in the bids. This exception does not, however, apply to tools, machinery, equipment or other property leased by or to the Contractor or a

Subcontractor or to materials and supplies of a kind which will not be incorporated into the completed project. (See Supplementary General Conditions, Article 15.)

2. Other Assessments and Taxes: Each bidder shall include in his base bid proposal all other costs and liabilities other than that excluded in the above paragraph for the amounts assessed or taxes upon the wages and salaries paid to employees of the Contractor and his Subcontractors, under the Contractor, or any other taxes assessed by the Federal, State, or Local Government.

12.0 Addenda and Interpretations: No interpretations of the meaning of the drawings, specifications or other contract documents will be made to any bidder orally. Every request for such interpretation shall be in writing addressed to: LAN Associates, Engineering, Planning, Architecture, Surveying, LLP, 252 Main Street, Goshen, NY 10924, Telephone #845-615-0350, Fax #845-615-0351 and to be given consideration must be received at least five (5) days prior to the date fixed for the opening of the bids. Any and all such interpretations and any supplementary instructions will be in the form of written addenda to the specifications or addenda drawings. Addenda will be mailed to all prospective bidders at the respective address furnished for the sending of drawings not later than three (3) days prior to the date as fixed for opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve any bidder from any obligations under this bid as submitted. All addenda so issued shall become part of the contract documents.

13.0 Security for Faithful Performance: The successful bidder shall deliver to the Owner, simultaneously with the executed contract, an executed Performance and Payment bond on AIA Form A312 in quadruplicate, each in the amount of one hundred percent (100%) of the contract amount, as specified hereinafter under the General Conditions. The premium for said bonds shall be included in the Contractor's Base Bid. The surety company or companies shall be acceptable to the Owner and Architect/Engineer and authorized to transact business in New York State.

The current power of attorney for the person who signs for any surety company shall be attached to such bond, indicating the surety or sureties on the bond.

14.0 Method of Award: Award of Contract may be made to the Lowest Qualified Bidder by method as follows:

1. If the award is to be made on the basis of Base Bid only, it may be made to that responsible bidder whose Base Bid therefore is the lowest.
2. If the award is to be made on the basis of the combination of Base Bid with Alternates, it may be made to that responsible bidder whose net bid on such combination is the lowest, using Alternates in any order elected by the Owner.

The Owner reserves the right to reject any and all bids.

15.0 Post-Bid Vetting:

Arris Contracting Co., Inc.  
189 Smith Street  
Poughkeepsie, NY 12601  
845-473-3600

Submissions must be emailed and must include the Project Name of this contract in the subject Line of the Pre-Award submission email.

- (1) Pre-award Submittal Package
  - (i) Fully executed AIA A305 Contractors Qualification Statement

Mount Pleasant CSD/Physical  
Education Department Renovations  
at Westlake High School  
NYSED #66-08-01-06-0-005-020

002113-3

#4.1449.08

- (ii) Most recent financial statement certified by CPM
  - (iii) References and experience:
    1. List of all past contracts for K-12 School Buildings
    2. Provide references (Name, Title, and Phone Number for Owner , Architect and Construction manager) associated with five (5) different projects of similar scope, size and complexity to the one identified in this contract. Additionally, include the names of two major suppliers used for each of these projects.
- (2) Workforce and Work Plan – Provide a detailed written Work Plan which shall demonstrate the contractor’s understanding of overall project scope and shall include, but not be limited, to the following:
- (i) Sequential listing of specific project activities required to successfully complete the Work of the contract.
    1. Include Critical Milestones,
    2. Include phasing of the Work, if required.
    3. Include listing of long lead items.
    4. Statement that the project can be completed in established time.
  - (ii) Resumes for Contractor’s proposed supervisory staff, including qualifications for specialized expertise or any certification(s) required to perform the Work.
  - (iii) Names of proposed sub-contractors and a listing of the related trade of work and value.
  - (iv) Any special coordination requirements with other trades.
  - (v) Any special storage and staging requirements for construction materials.
- (3) Detailed Cost Estimate:
- (i) A copy of a Detailed Cost Estimate outlined in CSI format.

16.0 Owner-Contractor Agreement: The form of Contract to be used is as included in the bid specification.

17.0 Final Payment & Maintenance Bond: Upon authorization and certification of the final payment by the Owner, the Owner shall pay the Contractor the amount of said estimate which shall be the balance due the Contractor, including the retained percentage, such sums as may be retained lawfully by the Owner except provided, the nothing herein contained shall be construed to affect the right hereby reserved by the Owner to reject the whole or any portion of the work should the final estimate and acceptance of such payment by the Contractor, shall release the Owner from all claims and liabilities to the Contractor with his contract.

Prior to authorization of the final payment by the Owner, and prior to the receipt by the Contractor of his final payment, the Contractor shall furnish to the Owner a maintenance bond in the amount of 100% of the total compensation earned by the Contractor in connection with the work. The bond shall be in a form acceptable to the Owner and with a surety company acceptable to the Owner. It shall remain in effect for two years after the date of authorization of the final payment by the Owner.

18.0 Final Payment & Maintenance Bond: Due to the ongoing COVID-19 pandemic and the resulting uncertainty with regard to (a) when the Owner’s school(s) will be in session during 2020, (b) what restrictions, if any, will be applicable to construction activities in the Owner’s facilities due to State, Federal or Local orders, laws, regulations or rules related to the COVID-19 pandemic (including but not limited to social distancing, cleaning and disinfection requirements) and (c) the duration of any restrictions imposed on construction activities, the Owner may modify the construction schedule set forth in the Contract/Bid Documents.

Any restrictions that will be applicable to construction activities in the Owner's facilities due to State, Federal or Local orders, laws, regulations or rules related to the COVID-19 pandemic (including but not limited to social distancing, cleaning and disinfection requirements) may cause the Owner to have the construction work commence later than the commencement date specified herein.

By submitting a bid, the Bidder acknowledges and agrees that there shall be no additional compensation paid for schedule modifications caused directly or indirectly by the COVID-19 pandemic. The Bidder further acknowledges and agrees that the sole remedy for any schedule modifications or delays caused directly or indirectly by the COVID-19 pandemic shall be an extension of time, if warranted.

END OF SECTION 002113



## 003000 – EXISTING HAZARDOUS MATERIAL INFORMATION

### 1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. An existing asbestos report for Project, prepared by Quality Environmental Solutions & Technologies, Inc, dated May 11, 2017, is available for viewing as appended to this Document.
- C. Related Requirements:
  - 1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
  - 2. Document 003132 "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.
  - 3. Section 024119 "Selective Structure Demolition" for notification requirements if materials suspected of containing hazardous materials are encountered.
  - 4. Section 028200 "Asbestos Abatement" for notification requirements if materials suspected of containing asbestos materials are encountered.

END OF SECTION 003000





Quality Environmental Solutions & Technologies, Inc.

**PRE-DEMOLITION SURVEY REPORT  
FOR  
ASBESTOS-CONTAINING MATERIALS (ACM)**

**Prepared for:  
MOUNT PLEASANT CSD  
825 Westlake Drive  
Thornwood, NY 10594**

at

**WESTLAKE HIGH SCHOOL  
(Gym Locker Rooms & Coach's Offices)  
825 Westlake Drive  
Thornwood, NY 10594**

**March 12, 2020**

**QuES&T Project #Q20-3217**

# QuES&T

Quality Environmental Solutions & Technologies, Inc.

March 12, 2020

Mount Pleasant CSD  
825 Westlake Drive  
Thornwood, NY 10594

**ATTN: Eric Strack**

Via E-mail: [estrack@mtplesd.org](mailto:estrack@mtplesd.org)

Re: Westlake High School “Gym Locker Rooms & Coach’s Office”  
825 Westlake Drive, Thornwood, NY 10594  
Pre-Demolition Asbestos Inspection  
QuES&T Project #Q20-3217

Dear Mr. Strack,

Attached is the Pre-Demolition Inspection Report for Asbestos-containing Materials (ACM) identified throughout interior areas included within the above-referenced location(s) by **Quality Environmental Solutions & Technologies, Inc. (QuES&T)**. The inspection included visual assessment and representative sampling for the detection of ACM in compliance with the requirements of Title 12 NYCRR Part 56-5.1.

The attached report summarizes the inspection protocol and inspection results for your review. **QuES&T** believes this report accurately reflects the material condition existing in the functional spaces at the time of our inspection.

Should you wish to discuss this matter further or require additional information concerning this submittal, please contact us at (845) 298-6031. **QuES&T** appreciates the opportunity to assist Mount Pleasant CSD in the environmental services area.

Sincerely,



**Jonathan Mages**

Field & Technical Services  
NYS/AHERA Inspector Cert. #AH 18-53364  
NYS Mold Assessor Cert. #MA01522  
Niton-Certified XRF Technician

Cc: **QuES&T** File

Cc: [gdean@qualityenv.com](mailto:gdean@qualityenv.com)

# QuES&T

Quality Environmental Solutions & Technologies, Inc.

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**Appendix A**      **Drawings & Photos**

**Appendix B**      **Sample Results**

**Appendix C**      **Personnel Licenses & Certifications**

## I. INTRODUCTION:

Quality Environmental Solutions & Technologies, Inc. (**QuES&T**) performed a Pre-Demolition Asbestos Survey, in conformance with Title 12 NYCRR Part 56-5.1, on February 19<sup>th</sup>, 2020 for Mount Pleasant CSD in support of the High School Locker Rooms & Coaches Offices Project, located at 825 Westlake Drive, Thornwood, NY 10594. The survey included a visual inspection / assessment for Presumed Asbestos-containing Materials (PACM) and suspect miscellaneous Asbestos-containing Materials (ACM) throughout accessible interior locations to be affected by future demolition activities.

**QuES&T** established functional spaces based either on physical barriers (i.e. walls, doors, etc.) or homogeneity of material. Within each functional space identified, a visual inspection was performed using reasonable care and judgment, to identify and assess location, quantity, friability and condition of all accessible installed ACM building materials observed at the affected portion of the building/structure.

Limited localized demolition of building surfaces was performed, as part of this survey, to access concealed surfaces. No disassembly of installed equipment was conducted as part of this inspection. ACM concealed within structural components and equipment interiors or that is accessible only through extensive mechanical or structural demolition may not have been identified as part of this survey. When any construction activity, such as demolition, remodeling, renovation or repair work, reveals PACM or suspect miscellaneous ACM that has not been identified, as part of this survey, all construction activities shall cease in the affected area.

The survey included both visual inspection of accessible spaces and representative sampling of suspect building materials for ACM. Samples collected were analyzed by a laboratory approved under the New York State Department of Health Environmental Laboratory Approval Program (NYSDOH ELAP). Samples were analyzed in the laboratory by Polarized Light Microscopy (PLM), Polarized Light Microscopy-NOB (PLM-NOB) and/or Quantitative Transmission Electron Microscopy (QTEM), as required. Sample collection and laboratory analysis were conducted in compliance with the requirements of Title 12 NYCRR Part 56-5.1, 29 CFR 1926.1101 and standard EPA & OSHA accepted methods. Samples consisting of multiple layers were separated and analyzed independently in the laboratory.

Certified **QuES&T** personnel (Appendix C), Mr. Tanay N. Ranadive (Cert. #AH 15-10696) & Mr. Jonathan R. Mages (Cert. #AH 18-53364) performed visual assessments throughout interior and exterior construction areas. A total of one hundred and two (**102**) samples of installed and accessible suspect building materials were analyzed by a laboratory approved under the NYSDOH ELAP. Sixty-five (**65**) samples were analyzed using Polarized Light Microscopy (PLM) for friable materials; nineteen (**19**) samples were analyzed using Polarized Light Microscopy (PLM-NOB) for non-friable organically bound materials; and eighteen (**18**) samples were analyzed by Confirmatory-QTEM following negative-determinations using PLM-NOB protocols.

## II. INSPECTION SUMMARY:

A visual inspection was performed, and homogenous material types were established based on appearance, color and texture. The findings presented in this report are based upon reasonably available information and observed site conditions at the time the assessment was performed. The findings and conclusions of this report are not meant to be indicative of future conditions at the site and does not warrant against conditions that were not evident from visual observations or historical information obtained from others.

Representative bulk sampling was performed on suspect building materials for laboratory analysis using PLM, PLM-NOB, and/or QTEM. The following is a summary of installed building materials sampled:

- Wall Materials – Joint Compound, Sheetrock, CMU Block & Mortar, Ceramic Tile Systems (tile, grout, mud set, mortar, etc.), Glazed Block & Mortar
- Ceiling Materials – Plaster, Ceiling Tiles (Splined & Suspended)
- Flooring Materials – Terrazzo, Ceramic Tile Systems (tile, grout, mud set, mortar, etc.), Floor Tile & Mastic
- Thermal System Insulation (TSI) Materials – Fiberglass Insulation, Mudded Pipe Joints/Elbows/Fittings
- Miscellaneous Materials – Covebase Molding & Adhesive, Caulks (Multiple)

### III. IDENTIFIED ASBESTOS-CONTAINING MATERIALS (ACM):

<b>IDENTIFIED ACM</b>				
<b><u>WESTLAKE HS 825 WESTLAKE DRIVE, THORNWOOD, NY 12594</u></b>				
<b>(Refer to Appendix A for details)</b>				
<b>KEY:</b> ACM = Materials containing greater than 1% of asbestos; LF = Linear Feet; SF = Square Feet; PACM = Presumed Asbestos-containing Materials; Friable = ACM capable of being released into air, and which can be crumbled, pulverized, powdered, crushed or exposed by hand-pressure.				
Location	Material	Approximate Quantity	Friable?	Condition
<b>Interiors</b>				
Girl's Coaches Office, Ceiling, 1'x1' Splined	ACM Ceiling Tiles ACM Mudded Joint Packing	144 SF 5 Elbows	No Yes	Good Good
Girl's Coaches Office, Above Plaster Ceiling	ACM Mudded Joint Packing	5 Elbows	Yes	Good
Girl's Locker Room	ACM Mudded Joint Packing	20 Elbows	Yes	Good
Girl's Locker Room Custodial Closet, Ceiling, 1'x1' Splined	ACM Ceiling Tiles	16 SF	No	Good
Boy's Coaches Office, Above Suspended Ceiling Tiles	ACM Mudded Joint Packing	4 Elbows	Yes	Good
Boy's Coaches Office, Bathroom, Above Plaster Ceiling	ACM Mudded Joint Packing	5 Elbows	Yes	Good
Boy's Locker Room	ACM Mudded Joint Packing	20 Elbows	Yes	Good
<b>Notes:</b> Additional Mudded Pipe Joints/Elbows/Fittings/etc. may exist behind wet walls and above hard ceilings; they may exist outside this scope of work.				

### IV. GENERAL DISCUSSION:

All construction personnel as well as individuals who have access to locations where asbestos containing materials (ACM) exists should be informed of its presence and the proper work practices in these areas. Conspicuous labeling of all ACM is suggested to ensure personnel is adequately informed. Personnel should be informed not to rest, lean or store material or equipment on or near these surfaces and not to cut, saw, drill, sand or disturb ACM. All removal, disturbance, and repair of ACM should be performed in compliance with Title 12 NYCRR Part 56 by persons properly trained to handle ACM. Facility custodial and maintenance personnel should receive training commensurate with their work activities; as defined in 29 CFR 1910.1001.

The findings presented in this report are based upon reasonably available information and observed site conditions at the time the assessment was performed. Conditions may have changed since that time and the findings and conclusions of this report are not meant to be indicative of future conditions at the Site. This report does not warrant against conditions that were not evident from visual observations or historical information obtained, or conditions that could only be determined by physical sampling or other intrusive investigation techniques that are outside the proposed scope of work.

## **V. ABATEMENT REQUIRED:**

As specified in Title 12 NYCRR Part 56-5.1 (h) and (i), "If the building/structure asbestos survey finds that the portion of the building/structure to be demolished, renovated, remodeled, or have repair work contains ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material, which is impacted by the work, the owner or the owner's agent shall conduct, or cause to have conducted, asbestos removal performed by a licensed asbestos abatement contractor in conformance with all standards set forth in this Part. All ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material impacted by the demolition, renovation, remodeling or repair project shall be removed as per this Part, prior to access or disturbance by other uncertified trades or personnel. No demolition, renovation, remodeling or repair work shall be commenced by any owner or the owner's agent prior to the completion of the asbestos abatement in accordance with the notification requirements of this Part...All building/structure owners and asbestos abatement contractors on a demolition, renovation, remodeling, or repair project, which includes work covered by this part, shall inform all trades on the work site about PACM, ACM, asbestos material and suspect miscellaneous ACM...Bids may be advertised and contracts awarded for demolition, remodeling, renovation, or repair work, but no work on the current intermediate portion of the project shall commence on the demolition, renovation, remodeling or repair work by any owner or agent prior to completion of all necessary asbestos abatement work for the current intermediate portion of the entire project, in conformance with all standards set forth in this Part."

Prior to conducting demolition or construction work at the building, all ACM affected/impacted by such activities shall be removed utilizing a licensed asbestos abatement contractor and NYS DOL/EPA/NYC certified personnel prior to construction/demolition activities. All work conducted should be in accordance with all legal requirements, including but not limited to U.S. Environmental Protection Agency (EPA) National Emissions Standards for Hazardous Air Pollutants (NESHAP) [40 CFR Part 61], New York State Industrial Code Rule 56 Asbestos Regulations (ICR 56) and Chapter 1 of Title 15 of the Rules of the City of New York Regulations, as applicable. Advance notification of the asbestos project to the USEPA, NYS DOL, and NYCDEP may be required.

All suspect building materials not sampled during this survey should be considered ACM until these materials are sampled and analyzed for ACM in the laboratory. Concealed ACM: In addition to the ACMs identified at the site, there is a possibility that concealed ACM may exist at the subject facility. As such, if any concealed suspect ACM is encountered during future construction related activities, the work should immediately stop. Prior to resuming the work, the suspect ACM should either be 1) Sampled by an appropriately-certified asbestos professional and submitted to an Approved NYSDOH ELAP laboratory for asbestos analysis or 2) Presumed to be ACM (PACM) and removed by a licensed asbestos abatement contractor for disposal in accordance with all applicable regulations.

## **VI. TRANSMITTAL OF BUILDING SURVEY INFORMATION:**

As specified in Title 12 NYCRR Part 56-5.1 (g), information derived from this building survey shall be immediately transmitted by the building owner or his/her agent to the commissioner through the Department's Division of Safety and Health, Asbestos Control Bureau, and to the local government entity charged with issuing a permit for such demolition under applicable State or local laws or, if no such permit is required, to the town or city clerk where the building is located.

## VII. DISCLAIMERS

It should be noted that the information contained within this report is based solely upon site observations and the results of laboratory analysis for samples collected by **QuES&T**. These observations and results are time dependent, subject to changing site conditions and revisions to Federal, State and Local regulations. **QuES&T** warrants that these findings have been promulgated after being prepared in general accordance with generally accepted practices in the abatement industries. **QuES&T** also recognizes that inspection laboratory data is not usually sufficient to make all abatement and management decisions.

Due to the potential for concealed Asbestos-containing Materials (ACM) or other regulated materials, this report should not be construed to represent all ACM or regulated materials within the site(s). All quantities of ACM or other regulated materials identified, and all dimensions listed within this report are approximate and should be verified On-site.

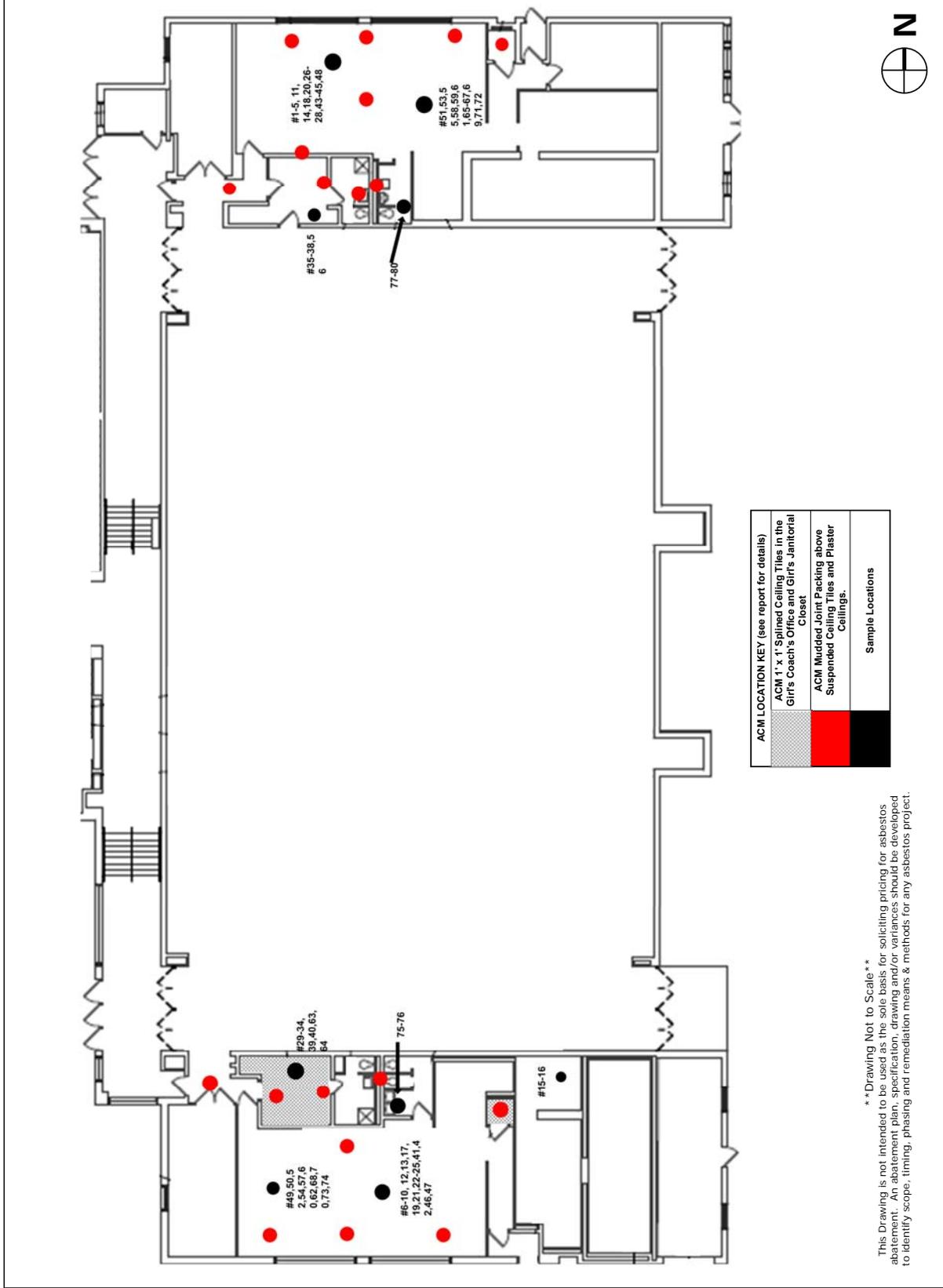
This inspection report is not intended to be used as the sole basis for soliciting pricing for asbestos abatement. An abatement plan, specification, drawing and/or Variances should be developed to identify scope, timing, phasing and remediation means & methods for any asbestos project. The Linear and/or Square Footages (LF / SF) listed within this Report are only approximates. Abatement Contractor(s) are required to visit the building(s) in order to take actual field measurements within each listed location.



Quality Environmental Solutions & Technologies, Inc.

## **Appendix A: DRAWINGS**

<b>Date:</b> 3-12-2020	<b>Version #</b> 1
<b>Issued For:</b> Pre-Demolition Asbestos Survey	
<b>QuES&amp;T Project #:</b> Q20-3217	
<b>Project Manager:</b> Greg Deah	<b>Prepared By:</b> Jon Magies
 <b>Quality Environmental Solutions &amp; Technologies, Inc.</b> 1376 Route 9 Wappingers Falls, NY 12590 Phone: (845) 298-6031 Fax: (845) 298-6251	
<b>CLIENT</b>	
<b>MOUNT PLEASANT CSD</b> 825 Westlake Drive Thornwood, NY 10594	
<b>PROJECT LOCATION</b>	
<b>WESTLAKE HIGH SCHOOL</b> 825 Westlake Drive Thornwood, NY 10594	
<b>FIRST FLOOR PLAN</b> Locker Rooms and Coach's Office ACM & Sample Locations	
<b>ASB-01</b>	



**\*\*Drawing Not to Scale\*\***  
 This Drawing is not intended to be used as the sole basis for soliciting pricing for asbestos abatement. An abatement plan, specification, drawing and/or variances should be developed to identify scope, timing, phasing and remediation means & methods for any asbestos project.



Quality Environmental Solutions & Technologies, Inc.

## **Appendix B: SAMPLE RESULTS**



# EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018  
Tel/Fax: (212) 290-0051 / (212) 290-0058  
<http://www.EMSL.com / manhattanlab@emsl.com>

**EMSL Order:** 032003792  
**Customer ID:** QUES51  
**Customer PO:**  
**Project ID:**

**Attention:** Lab Results  
Quality Environmental Solution & Tech  
1376 Rt 9  
Wappingers Falls, NY 12590  
**Phone:** (845) 298-6031  
**Fax:** (845) 298-6251  
**Received Date:** 02/22/2020 9:56 AM  
**Analysis Date:** 02/26/2020 - 02/27/2020  
**Collected Date:** 02/19/2020  
**Project:** Q20-3217/ WESTLAKE HS- COACHES OFFICE/ LOCKER ROOMS/ PRE-DEMO ASB SURVEY

## Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
<b>Sample ID</b> 3217-01 <i>032003792-0001</i>		<b>Description</b>	BOYS LOCKER ROOM, PERIMETER WALL, PILLAR, ON SHEETROCK - JOINT COMPOUND		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	White		65.00% Ca Carbonate 35.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-02 <i>032003792-0002</i>		<b>Description</b>	BOYS LOCKER ROOM, PERIMETER WALL, PILLAR, ON SHEETROCK - JOINT COMPOUND		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	White		65.00% Ca Carbonate 35.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-03 <i>032003792-0003</i>		<b>Description</b>	BOYS LOCKER ROOM, PERIMETER WALL, PILLAR, ON SHEETROCK - JOINT COMPOUND		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	White		65.00% Ca Carbonate 35.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-04 <i>032003792-0004</i>		<b>Description</b>	BOYS LOCKER ROOM, PERIMETER WALL, PILLAR - SHEETROCK		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Brown/ Gray	15.00% Cellulose 3.00% Glass	65.00% Gypsum 17.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-05 <i>032003792-0005</i>		<b>Description</b>	BOYS LOCKER ROOM, PERIMETER WALL, PILLAR - SHEETROCK		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Gray	10.00% Cellulose 3.00% Glass	55.00% Gypsum 32.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>

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# EMSL Analytical, Inc.

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EMSL Order: 032003792

Customer ID: QUES51

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
<b>Sample ID</b> 3217-06 032003792-0006			<b>Description</b> GIRLS LOCKER ROOM, BATHROOM, CEILING - PLASTER <b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Gray/ White		40.00% Ca Carbonate 45.00% Gypsum 15.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-07 032003792-0007			<b>Description</b> GIRLS LOCKER ROOM, BATHROOM, CEILING - PLASTER <b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Gray/ White		35.00% Ca Carbonate 40.00% Gypsum 25.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-08 032003792-0008			<b>Description</b> GIRLS LOCKER ROOM, BATHROOM, CEILING - PLASTER <b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Gray/ White		35.00% Ca Carbonate 45.00% Gypsum 20.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-09 032003792-0009			<b>Description</b> GIRLS LOCKER ROOM, BATHROOM, CEILING - PLASTER <b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Gray/ White		30.00% Ca Carbonate 45.00% Gypsum 25.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-10 032003792-0010			<b>Description</b> GIRLS LOCKER ROOM, BATHROOM, CEILING - PLASTER <b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Gray/ White		30.00% Ca Carbonate 45.00% Gypsum 25.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>

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EMSL Order: 032003792

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## Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
<b>Sample ID</b> 3217-11 032003792-0011			<b>Description</b> BOYS LOCKER ROOM, WALL - CEMENTITIOUS BLOCK		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Gray		20.00% Ca Carbonate 50.00% Non-fibrous (other) 30.00% Quartz	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-12 032003792-0012			<b>Description</b> GIRLS LOCKER ROOM, WALL - CEMENTITIOUS BLOCK		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Gray		30.00% Ca Carbonate 25.00% Non-fibrous (other) 45.00% Quartz	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-13 032003792-0013			<b>Description</b> GIRLS LOCKER ROOM, WALL, ON CEMENTITIOUS BLOCK - MORTAR		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Gray		25.00% Ca Carbonate 30.00% Non-fibrous (other) 45.00% Quartz	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-14 032003792-0014			<b>Description</b> BOYS LOCKER ROOM, WALL, ON CEMENTITIOUS BLOCK - MORTAR		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Gray		35.00% Ca Carbonate 20.00% Non-fibrous (other) 45.00% Quartz	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-15 032003792-0015			<b>Description</b> GIRLS LOCKER ROOM, SHOWER ROOM, STALL, FLOOR - TERRAZZO		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	White		25.00% Ca Carbonate 75.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>

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EMSL Order: 032003792

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## Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
<b>Sample ID</b> 3217-16 032003792-0016			<b>Description</b> GIRLS LOCKER ROOM, SHOWER ROOM, STALL, FLOOR - TERRAZZO		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	White		55.00% Ca Carbonate 45.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-17 032003792-0017			<b>Description</b> GIRLS LOCKER ROOM, ABOVE SUSPENDED CEILING, ON METAL DUCTWORK, FB - INSULATION		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Brown	90.00% Min. Wool	10.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-18 032003792-0018			<b>Description</b> BOYS LOCKER ROOM, ABOVE SUSPENDED CEILING, ON METAL DUCTWORK, FB - INSULATION		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Brown	90.00% Glass	10.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-19 032003792-0019			<b>Description</b> GIRLS LOCKER ROOM, ABOVE SUSPENDED CEILING, ON METAL DUCTWORK, FB - INSULATION		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Brown	80.00% Glass	20.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-20-Pipe Wrap 032003792-0020			<b>Description</b> BOYS LOCKER ROOM, AROUND METAL PIPE, FG - PIPE WRAP & INSULATION		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Tan	90.00% Cellulose	10.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-20-Insulation 032003792-0020A			<b>Description</b> BOYS LOCKER ROOM, AROUND METAL PIPE, FG - PIPE WRAP & INSULATION		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Silver/ Yellow	55.00% Glass	45.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>

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EMSL Order: 032003792

Customer ID: QUES51

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## Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
<b>Sample ID</b> 3217-21-Pipe Wrap 032003792-0021			<b>Description</b> GIRLS LOCKER ROOM, AROUND METAL PIPE, FG - PIPE WRAP & INSULATION <b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Brown	80.00% Cellulose	20.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-21-Insulation 032003792-0021A			<b>Description</b> GIRLS LOCKER ROOM, AROUND METAL PIPE, FG - PIPE WRAP & INSULATION <b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Silver/ Yellow	10.00% Cellulose 50.00% Glass	40.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-22-Pipe Wrap 032003792-0022			<b>Description</b> GIRLS LOCKER ROOM, AROUND METAL PIPE, FG - PIPE WRAP & INSULATION <b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Brown	80.00% Cellulose	20.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-22-Insulation 032003792-0022A			<b>Description</b> GIRLS LOCKER ROOM, AROUND METAL PIPE, FG - PIPE WRAP & INSULATION <b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Tan	85.00% Glass	15.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-23 032003792-0023			<b>Description</b> GIRLS LOCKER ROOM, ALONG PERIMETER WALL, ON METAL PIPE ELBOW - MUDDERED JOINT PACKING <b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Gray	5.00% Cellulose	20.00% Ca Carbonate 54.00% Non-fibrous (other)	<b>21.00% Chrysotile</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-24 032003792-0024			<b>Description</b> GIRLS LOCKER ROOM, ALONG PERIMETER WALL, ON METAL PIPE ELBOW - MUDDERED JOINT PACKING <b>Homogeneity</b>		
<b>PLM NYS 198.1 Friable</b>	02/26/2020				<b>Positive Stop (Not Analyzed)</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>

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EMSL Order: 032003792

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## Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 3217-25 032003792-0025		Description GIRLS LOCKER ROOM, ALONG PERIMETER WALL, ON METAL PIPE ELBOW - MUDDED JOINT PACKING			
		Homogeneity			
PLM NYS 198.1 Friable	02/26/2020				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 3217-26 032003792-0026		Description BOYS COACHES OFFICE, ABOVE SUSPENDED CEILING. ON METAL PIPE ELBOW - MUDDED JOINT PACKING			
		Homogeneity Homogeneous			
PLM NYS 198.1 Friable	02/26/2020	Gray	10.00% Cellulose	20.00% Ca Carbonate 50.00% Non-fibrous (other)	20.00% Chrysotile
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 3217-27 032003792-0027		Description BOYS LOCKER ROOM, ABOVE SUSPENDED CEILING. ON METAL PIPE ELBOW - MUDDED JOINT PACKING			
		Homogeneity			
PLM NYS 198.1 Friable	02/26/2020				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 3217-28 032003792-0028		Description BOYS LOCKER ROOM, ABOVE SUSPENDED CEILING. ON METAL PIPE ELBOW - MUDDED JOINT PACKING			
		Homogeneity			
PLM NYS 198.1 Friable	02/26/2020				Positive Stop (Not Analyzed)
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 3217-29 032003792-0029		Description GIRLS COACHES OFFICE, FLOOR, ON SLAB, BROWN - CERAMIC TILE			
		Homogeneity Homogeneous			
PLM NYS 198.1 Friable	02/26/2020	Brown		100.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed
Sample ID 3217-30 032003792-0030		Description GIRLS COACHES OFFICE, FLOOR, ON SLAB, BROWN - CERAMIC TILE			
		Homogeneity Homogeneous			
PLM NYS 198.1 Friable	02/27/2020	Brown		100.00% Non-fibrous (other)	None Detected
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB					Not Analyzed
TEM NYS 198.4 NOB					Not Analyzed

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## Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
<b>Sample ID</b> 3217-31 032003792-0031		<b>Description</b>	GIRLS COACHES OFFICE, FLOOR, ON SLAB, TAN - CERAMIC TILE		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Tan		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-32 032003792-0032		<b>Description</b>	GIRLS COACHES OFFICE, FLOOR, ON SLAB, TAN - CERAMIC TILE		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	White		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-33-Ceramic Tile 032003792-0033		<b>Description</b>	GIRLS COACHES OFFICE, WALLBASE, YELLOW - CERAMIC TILE & MORTAR		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	White/ Yellow		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-33-Mortar 032003792-0033A		<b>Description</b>	GIRLS COACHES OFFICE, WALLBASE, YELLOW - CERAMIC TILE & MORTAR		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Tan		20.00% Ca Carbonate 80.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-34-Ceramic Tile 032003792-0034		<b>Description</b>	GIRLS COACHES OFFICE, WALLBASE, YELLOW - CERAMIC TILE & MORTAR		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Yellow		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-34-Mortar 032003792-0034A		<b>Description</b>	GIRLS COACHES OFFICE, WALLBASE, YELLOW - CERAMIC TILE & MORTAR		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Tan		30.00% Ca Carbonate 70.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>

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**EMSL Order:** 032003792  
**Customer ID:** QUES51  
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**Project ID:**

## Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
<b>Sample ID</b> 3217-35 032003792-0035		<b>Description</b>	BOYS COACHES OFFICE, FLOOR, ON SLAB - CERAMIC TILE		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Blue		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-36 032003792-0036		<b>Description</b>	BOYS COACHES OFFICE, FLOOR, ON SLAB - CERAMIC TILE		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Blue		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-37 032003792-0037		<b>Description</b>	BOYS COACHES OFFICE, WALLBASE - CERAMIC TILE		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	White/ Blue		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-38 032003792-0038		<b>Description</b>	BOYS COACHES OFFICE, WALLBASE - CERAMIC TILE		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Blue		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-39 032003792-0039		<b>Description</b>	GIRLS COACHES OFFICE, WALL, ON CERAMIC TILE - GROUT		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Tan		30.00% Ca Carbonate 70.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-40 032003792-0040		<b>Description</b>	GIRLS COACHES OFFICE, WALL, ON CERAMIC TILE - GROUT		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	White		40.00% Ca Carbonate 60.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>

Initial report from: 02/27/2020 13:48:38



# EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

Tel/Fax: (212) 290-0051 / (212) 290-0058

<http://www.EMSL.com> / [manhattanlab@emsl.com](mailto:manhattanlab@emsl.com)

EMSL Order: 032003792

Customer ID: QUES51

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
<b>Sample ID</b> 3217-41 032003792-0041			<b>Description</b> GIRLS LOCKER ROOM, FLOOR, ON SLAB, BLUE - CERAMIC TILE		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Gray		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-42 032003792-0042			<b>Description</b> GIRLS LOCKER ROOM, FLOOR, ON SLAB, BLUE - CERAMIC TILE		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	White		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-43 032003792-0043			<b>Description</b> BOYS LOCKER ROOM, FLOOR, UNDER CERAMIC TILE, ON SLAB - CERAMIC TILE		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Tan		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-44 032003792-0044			<b>Description</b> BOYS LOCKER ROOM, FLOOR, UNDER CERAMIC TILE, ON SLAB - CERAMIC TILE		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Tan		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-45 032003792-0045			<b>Description</b> BOYS LOCKER ROOM, WALLBASE - GLAZED BLOCK		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Tan		90.00% Non-fibrous (other) 10.00% Quartz	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-46 032003792-0046			<b>Description</b> GIRLS LOCKER ROOM, WALLBASE - GLAZED BLOCK		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Tan		95.00% Non-fibrous (other) 5.00% Quartz	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>

Initial report from: 02/27/2020 13:48:38



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EMSL Order: 032003792

Customer ID: QUES51

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
<b>Sample ID</b> 3217-47 032003792-0047			<b>Description</b> GIRLS LOCKER ROOM, WALLBASE, ON GLAZED BLOCK - MORTAR		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Gray		20.00% Ca Carbonate 35.00% Non-fibrous (other) 45.00% Quartz	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-48 032003792-0048			<b>Description</b> BOYS LOCKER ROOM, WALLBASE, ON GLAZED BLOCK - MORTAR		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Tan		20.00% Ca Carbonate 30.00% Non-fibrous (other) 50.00% Quartz	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-49 032003792-0049			<b>Description</b> GIRLS LOCKER ROOM, FLOOR, ON SLAB, PINK - CERAMIC TILE		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Pink		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-50 032003792-0050			<b>Description</b> GIRLS LOCKER ROOM, FLOOR, ON SLAB, PINK - CERAMIC TILE		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Beige		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-51 032003792-0051			<b>Description</b> BOYS LOCKER ROOM, FLOOR, UNDER FLOOR TILE, AROUND CERAMIC TILE - GROUT		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Brown		20.00% Ca Carbonate 45.00% Non-fibrous (other) 35.00% Quartz	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-52 032003792-0052			<b>Description</b> GIRLS LOCKER ROOM, FLOOR, UNDER FLOOR TILE, AROUND CERAMIC TILE - GROUT		
			<b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Gray		15.00% Ca Carbonate 40.00% Non-fibrous (other) 45.00% Quartz	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>

Initial report from: 02/27/2020 13:48:38



# EMSL Analytical, Inc.

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**EMSL Order:** 032003792  
**Customer ID:** QUES51  
**Customer PO:**  
**Project ID:**

## Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
<b>Sample ID</b> 3217-53 <i>032003792-0053</i>		<b>Description</b>	BOYS LOCKER ROOM, FLOOR, UNDER FLOOR TILE & CERAMIC TILE, ON SLAB - MUDSET		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Gray		20.00% Ca Carbonate 35.00% Non-fibrous (other) 45.00% Quartz	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-54 <i>032003792-0054</i>		<b>Description</b>	GIRLS LOCKER ROOM, FLOOR, UNDER FLOOR TILE & CERAMIC TILE, ON SLAB - MUDSET		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Gray		20.00% Ca Carbonate 50.00% Non-fibrous (other) 30.00% Quartz	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-55 <i>032003792-0055</i>		<b>Description</b>	BOYS LOCKER ROOM, FLOOR, UNDER FLOOR TILE, ON SLAB - CERAMIC TILE		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Blue		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-56 <i>032003792-0056</i>		<b>Description</b>	BOYS COACHES OFFICE, FLOOR, ON SLAB - CERAMIC TILE		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Blue		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-57-Ceramic Tile <i>032003792-0057</i>		<b>Description</b>	GIRLS LOCKER ROOM, SHOWER WALL, ON CEMENTITIOUS BLOCK - CERAMIC TILE & MORTAR		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	White/ Pink		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-57-Mortar <i>032003792-0057A</i>		<b>Description</b>	GIRLS LOCKER ROOM, SHOWER WALL, ON CEMENTITIOUS BLOCK - CERAMIC TILE & MORTAR		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Tan		25.00% Ca Carbonate 75.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>

Initial report from: 02/27/2020 13:48:38



# EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018  
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<http://www.EMSL.com / manhattanlab@emsl.com>

**EMSL Order:** 032003792  
**Customer ID:** QUES51  
**Customer PO:**  
**Project ID:**

## Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
<b>Sample ID</b> 3217-58-Ceramic Tile <i>032003792-0058</i>		<b>Description</b>	BOYS LOCKER ROOM, SHOWER WALL, ON CEMENTITIOUS BLOCK - CERAMIC TILE & MORTAR		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Yellow		100.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-58-Mortar <i>032003792-0058A</i>		<b>Description</b>	BOYS LOCKER ROOM, SHOWER WALL, ON CEMENTITIOUS BLOCK - CERAMIC TILE & MORTAR		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Gray		30.00% Ca Carbonate 70.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-59 <i>032003792-0059</i>		<b>Description</b>	BOYS LOCKER ROOM, SHOWER WALL, ON CERAMIC TILE - GROUT		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	White		30.00% Ca Carbonate 70.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-60 <i>032003792-0060</i>		<b>Description</b>	GIRLS LOCKER ROOM, SHOWER WALL, ON CERAMIC TILE - GROUT		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Gray		30.00% Ca Carbonate 70.00% Non-fibrous (other)	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-61 <i>032003792-0061</i>		<b>Description</b>	BOYS LOCKER ROOM, UNDER WALLBASE, ON SLAB - MUDSET		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/26/2020	Gray		20.00% Ca Carbonate 35.00% Non-fibrous (other) 45.00% Quartz	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>
<b>Sample ID</b> 3217-62 <i>032003792-0062</i>		<b>Description</b>	GIRLS LOCKER ROOM, UNDER WALLBASE, ON SLAB - MUDSET		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>	02/27/2020	Gray		20.00% Ca Carbonate 30.00% Non-fibrous (other) 50.00% Quartz	<b>None Detected</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>					<b>Not Analyzed</b>
<b>TEM NYS 198.4 NOB</b>					<b>Not Analyzed</b>

Initial report from: 02/27/2020 13:48:38



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<b>EMSL Order:</b> 032003792
<b>Customer ID:</b> QUES51
<b>Customer PO:</b>
<b>Project ID:</b>

## Test Report:Asbestos Analysis of Bulk Material

The samples in this report were submitted to EMSL for analysis by Asbestos Analysis of Bulk Materials via NYS ELAP Approved Methods. The reference number for these samples is the EMSL Order ID above. Please use this reference number when calling about these samples.

### Report Comments:

Sample Receipt Date: 2/22/2020  
Analysis Completed Date: 2/26/2020

Sample Receipt Time: 9:56 AM  
Analysis Completed Time: 10:27 PM

### Analyst(s):

Ghaly Hemaya PLM NYS 198.1 Friable (37)

Migena Shehu PLM NYS 198.1 Friable (28)

### Samples reviewed and approved by:

James Hall, Laboratory Manager  
or Other Approved Signatory

NOB = Non Friable Organically Bound N/A = Not Applicable VCM = Vermiculite Containing Material

-In New York State, TEM is currently the only method that can be used to determine if NOB materials can be considered or treated as non-asbestos containing.

All samples examined for the presence of vermiculite when analyzed via NYS 198.1.

-NYS Guidelines for Vermiculite containing samples are available at [http://www.wadsworth.org/labcert/elapcert/forms/VermiculiteInterimGuidance\\_Rev070913.pdf](http://www.wadsworth.org/labcert/elapcert/forms/VermiculiteInterimGuidance_Rev070913.pdf) EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples were received in good condition unless otherwise noted.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. This report may contain data that is not covered by the NVLAP accreditation.

Samples analyzed by EMSL Analytical, Inc. New York, NY NYS ELAP 11506

Initial report from: 02/27/2020 13:48:38

032003792

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

**BULK SAMPLE FORM**

CLIENT: Mount Pleasant CSD  
 ADDRESS: 825 Westlake Dr  
Thornwood, NY 10594  
 CONTACT: Eric Strack  
 PROJECT ID: Westlake HS - Coaches Office/Locker Rooms  
Pre-Demo ASB Survey  
 PROJECT #: Q20-3217

SAMPLED BY: J. Mages, T. Ranadive  
 DATE SAMPLED: 19-Feb-20  
 ANALYSIS METHOD: PLM/NOB/QTEM as Required  
 TURN-AROUND TIME: \_\_\_\_\_ HOURS  
5 DAYS  
 OTHER

EMSL MANHATTAN LAB  
 RECEIVED  
 20 FEB 22 AM 9:56

Please contact Greg Dean (gdean@qualityenv.com) if samples test positive for vermiculite

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
3217-01	Boys Locker Room, Perimeter Wall, Pillar, on Sheetrock	Joint Compound	
3217-02	Boys Locker Room, Perimeter Wall, Pillar, on Sheetrock	Joint Compound	
3217-03	Boys Locker Room, Perimeter Wall, Pillar, on Sheetrock	Joint Compound	
3217-04	Boys Locker Room, Perimeter Wall, Pillar	Sheetrock	
3217-05	Boys Locker Room, Perimeter Wall, Pillar	Sheetrock	
3217-06	Girls Locker Room, Bathroom, Ceiling	Plaster	
3217-07	Girls Locker Room, Bathroom, Ceiling	Plaster	
3217-08	Girls Locker Room, Bathroom, Ceiling	Plaster	
3217-09	Girls Locker Room, Bathroom, Ceiling	Plaster	
3217-10	Girls Locker Room, Bathroom, Ceiling	Plaster	

Please contact Greg Dean (gdean@qualityenv.com) if samples test positive for vermiculite

**CHAIN OF CUSTODY (SEE LAST PAGE)**

SUBMITTED BY: [Signature]  
 RECEIVED BY: [Signature]

DATE: 2/21/2020  
 DATE: 2/22/20 9:56AM

[Signature] 2/26/20



032003792

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

**BULK SAMPLE FORM**

CLIENT: Mount Pleasant CSD SAMPLED BY: J. Mages, T. Ranadive  
 ADDRESS: 825 Westlake Dr DATE SAMPLED: 19-Feb-20  
Thornwood, NY 10594  
 CONTACT: Eric Strack ANALYSIS METHOD: PLM/NOB/QTEM as Required  
 PROJECT ID: Westlake HS - Coaches Office/Locker Rooms TURN-AROUND TIME: \_\_\_\_\_ HOURS  
Pre-Demo ASB Survey 5 DAYS  
 PROJECT #: Q20-3217 OTHER

EMSL MANHATTAN LAB  
 RECEIVED  
 20 FEB 22 AM 9:56

Please contact Greg Dean (gdean@qualityenv.com) if samples test positive for vermiculite			
SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
3217-21	Girls Locker Room, Around Metal Pipe, FG	Pipe Wrap & Insulation (Separate Layers)	
3217-22	Girls Locker Room, Around Metal Pipe, FG	Pipe Wrap & Insulation (Separate Layers)	
3217-23	Girls Locker Room, Along Perimeter Wall, on Metal Pipe Elbow	Mudded Joint Packing	Stop
3217-24	Girls Locker Room, Along Perimeter Wall, on Metal Pipe Elbow	Mudded Joint Packing	At First
3217-25	Girls Locker Room, Along Perimeter Wall, on Metal Pipe Elbow	Mudded Joint Packing	Positive
3217-26	Boys Coaches Office, Above Suspended Ceiling, on Metal Pipe Elbow	Mudded Joint Packing	Stop
3217-27	Boys Locker Room, Above Suspended Ceiling, on Metal Pipe Elbow	Mudded Joint Packing	At First
3217-28	Boys Locker Room, Above Suspended Ceiling, on Metal Pipe Elbow	Mudded Joint Packing	Positive
3217-29	Girls Coaches Office, Floor, on Slab, Brown	Ceramic Tile	
3217-30	Girls Coaches Office, Floor, on Slab, Brown	Ceramic Tile	
Please contact Greg Dean (gdean@qualityenv.com) if samples test positive for vermiculite			

**CHAIN OF CUSTODY (SEE LAST PAGE)**

SUBMITTED BY: [Signature] DATE: 2/21/2020  
 RECEIVED BY: [Signature] DATE: 2/22/20 9:56AM



032003792

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

**BULK SAMPLE FORM**

MSL MANHATTAN LAB  
20 FEB 22 AM 9:56

CLIENT: Mount Pleasant CSD SAMPLED BY: J. Mages, T. Ranadive  
 ADDRESS: 825 Westlake Dr DATE SAMPLED: 19-Feb-20  
Thornwood, NY 10594  
 CONTACT: Eric Strack ANALYSIS METHOD: PLM/NOB/QTEM as Required  
 PROJECT ID: Westlake HS - Coaches Office/Locker Rooms TURN-AROUND TIME: \_\_\_\_\_ HOURS  
Pre-Demo ASB Survey 5 DAYS  
 PROJECT #: Q20-3217 OTHER

Please contact Greg Dean (gdean@qualityenv.com) if samples test positive for vermiculite

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
3217-41	Girls Locker Room, Floor, on Slab, Blue	Ceramic Tile	Stop At First Positive
3217-42	Girls Locker Room, Floor, on Slab, Blue	Ceramic Tile	
3217-43	Boys Locker Room, Floor, Under Ceramic Tile, on Slab	Ceramic Tile	Stop At First Positive
3217-44	Boys Locker Room, Floor, Under Ceramic Tile, on Slab	Ceramic Tile	
3217-45	Boys Locker Room, Wallbase	Glazed Block	Stop At First Positive
3217-46	Girls Locker Room, Wallbase	Glazed Block	
3217-47	Girls Locker Room, Wallbase, on Glazed Block	Mortar	Stop At First Positive
3217-48	Boys Locker Room, Wallbase, on Glazed Block	Mortar	
3217-49	Girls Locker Room, Floor, on Slab, Pink	Ceramic Tile	Stop At First Positive
3217-50	Girls Locker Room, Floor, on Slab, Pink	Ceramic Tile	

Please contact Greg Dean (gdean@qualityenv.com) if samples test positive for vermiculite

**CHAIN OF CUSTODY (SEE LAST PAGE)**

SUBMITTED BY: [Signature] DATE: 2/21/2020  
 RECEIVED BY: [Signature] DATE: 2/22/20 9:56 AM

032003792

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

**BULK SAMPLE FORM**

CLIENT: Mount Pleasant CSD SAMPLED BY: J. Mages, T. Ranadive  
 ADDRESS: 825 Westlake Dr DATE SAMPLED: 19-Feb-20  
Thornwood, NY 10594  
 CONTACT: Eric Strack ANALYSIS METHOD: PLM/NOB/QTEM as Required  
 PROJECT ID: Westlake HS - Coaches Office/Locker Rooms TURN-AROUND TIME: \_\_\_\_\_ HOURS  
Pre-Demo ASB Survey 5 DAYS  
 PROJECT #: Q20-3217 OTHER

EMSL MANHATTAN LAB  
 20 FEB 22 AM 9:56

Please contact Greg Dean (gdean@qualityenv.com) if samples test positive for vermiculite			
SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
3217-51	Boys Locker Room, Floor, under Floor Tile, Around Ceramic Tile	Grout	Stop At First
3217-52	Girls Locker Room, Floor, under Floor Tile, Around Ceramic Tile	Grout	Positive
3217-53	Boys Locker Room, Floor, Under Floor Tile & Ceramic Tile, on Slab	Mudset	Stop At First
3217-54	Girls Locker Room, Floor, Under Floor Tile & Ceramic Tile, on Slab	Mudset	Positive
3217-55	Boys Locker Room, Floor, Under Floor Tile, on Slab	Ceramic Tile	Stop At First
3217-56	Boys Coaches Office, Floor, on Slab	Ceramic Tile	Positive
3217-57	Girls Locker Room, Shower Wall, on Cementitious Block	Ceramic Tile & Mortar (Separate Layers)	Stop At First
3217-58	Boys Locker Room, Shower Wall, on Cementitious Block	Ceramic Tile & Mortar (Separate Layers)	Positive
3217-59	Boys Locker Room, Shower Wall, on Ceramic Tile	Grout	Stop At First
3217-60	Girls Locker Room, Shower Wall, on Ceramic Tile	Grout	Positive
Please contact Greg Dean (gdean@qualityenv.com) if samples test positive for vermiculite			

**CHAIN OF CUSTODY (SEE LAST PAGE)**

SUBMITTED BY: [Signature] DATE: 2/21/2020  
 RECEIVED BY: [Signature] DATE: 2/22/20 9:56 AM





# EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018  
Tel/Fax: (212) 290-0051 / (212) 290-0058  
<http://www.EMSL.com / manhattanlab@emsl.com>

**EMSL Order:** 032003794  
**Customer ID:** QUES51  
**Customer PO:**  
**Project ID:**

**Attention:** Lab Results  
Quality Environmental Solution & Tech  
1376 Rt 9  
Wappingers Falls, NY 12590  
**Phone:** (845) 298-6031  
**Fax:** (845) 298-6251  
**Received Date:** 02/22/2020 9:57 AM  
**Analysis Date:** 02/26/2020 - 02/27/2020  
**Collected Date:** 02/19/2020  
**Project:** Q20-3217/ WESTLAKE HS- COACHES OFFICE/ LOCKER ROOMS/ PRE-DEMO ASB SURVEY

## Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
<b>Sample ID</b> 3217-63 032003794-0001			<b>Description</b> GIRLS COACHES OFFICE, CEILING, 1'X1', SPLINED - CEILING TILE <b>Homogeneity</b> Heterogeneous		
<b>PLM NYS 198.1 Friable</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>	02/26/2020	Gray	None	92.50% Other	<b>7.50% Amosite</b>
<b>TEM NYS 198.4 NOB</b>	02/26/2020				<b>Positive Stop (Not Analyzed)</b>
<b>Sample ID</b> 3217-64 032003794-0002			<b>Description</b> GIRLS COACHES OFFICE, CEILING, 1'X1', SPLINED - CEILING TILE <b>Homogeneity</b>		
<b>PLM NYS 198.1 Friable</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>	02/26/2020				<b>Positive Stop (Not Analyzed)</b>
<b>TEM NYS 198.4 NOB</b>	02/26/2020				<b>Positive Stop (Not Analyzed)</b>
<b>Sample ID</b> 3217-65 032003794-0003			<b>Description</b> BOYS LOCKER ROOM, SUSPENDED CEILING, 2'X2', TEXTURED DOTTED - CEILING TILE <b>Homogeneity</b> Heterogeneous		
<b>PLM NYS 198.1 Friable</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>	02/26/2020	Gray		100.00% Other	<b>Inconclusive: None Detected</b>
<b>TEM NYS 198.4 NOB</b>	02/27/2020	Gray		100.00% Other	<b>None Detected</b>
<b>Sample ID</b> 3217-66 032003794-0004			<b>Description</b> BOYS LOCKER ROOM, SUSPENDED CEILING, 2'X2', TEXTURED DOTTED - CEILING TILE <b>Homogeneity</b> Homogeneous		
<b>PLM NYS 198.1 Friable</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>	02/26/2020	Gray		100.00% Other	<b>Inconclusive: None Detected</b>
<b>TEM NYS 198.4 NOB</b>	02/27/2020	Gray		100.00% Other	<b>None Detected</b>
<b>Sample ID</b> 3217-67 032003794-0005			<b>Description</b> BOYS LOCKER ROOM, SUSPENDED CEILING, 2'X2', DOTTED - CEILING TILE <b>Homogeneity</b> Heterogeneous		
<b>PLM NYS 198.1 Friable</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>	02/26/2020	Gray		100.00% Other	<b>Inconclusive: None Detected</b>
<b>TEM NYS 198.4 NOB</b>	02/27/2020	Gray		100.00% Other	<b>None Detected</b>

Initial report from: 02/27/2020 10:47:47



# EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

Tel/Fax: (212) 290-0051 / (212) 290-0058

<http://www.EMSL.com> / [manhattanlab@emsl.com](mailto:manhattanlab@emsl.com)

**EMSL Order:** 032003794  
**Customer ID:** QUES51  
**Customer PO:**  
**Project ID:**

## Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
<b>Sample ID</b> 3217-68 032003794-0006			<b>Description</b>	GIRLS LOCKER ROOM, SUSPENDED CEILING, 2'X2', DOTTED - CEILING TILE	
			<b>Homogeneity</b>	Homogeneous	
<b>PLM NYS 198.1 Friable</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>	02/26/2020	Gray		100.00% Other	<b>Inconclusive: None Detected</b>
<b>TEM NYS 198.4 NOB</b>	02/27/2020	Gray		100.00% Other	<b>None Detected</b>
<b>Sample ID</b> 3217-69 032003794-0007			<b>Description</b>	BOYS LOCKER ROOM, SUSPENDED CEILING, 2'X2', DOT CANYON - CEILING TILE	
			<b>Homogeneity</b>	Heterogeneous	
<b>PLM NYS 198.1 Friable</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>	02/26/2020	Gray		100.00% Other	<b>Inconclusive: None Detected</b>
<b>TEM NYS 198.4 NOB</b>	02/27/2020	Gray		100.00% Other	<b>None Detected</b>
<b>Sample ID</b> 3217-70 032003794-0008			<b>Description</b>	GIRLS LOCKER ROOM, SUSPENDED CEILING, 2'X2', DOT CANYON - CEILING TILE	
			<b>Homogeneity</b>	Homogeneous	
<b>PLM NYS 198.1 Friable</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>	02/26/2020	Gray		100.00% Other	<b>Inconclusive: None Detected</b>
<b>TEM NYS 198.4 NOB</b>	02/27/2020	Gray		100.00% Other	<b>None Detected</b>
<b>Sample ID</b> 3217-71-Cove Base 032003794-0009			<b>Description</b>	BOYS LOCKER ROOM, ON CEMENTITIOUS BLOCK WALL - COVE BASE MOLDING & ADHESIVE	
			<b>Homogeneity</b>	Heterogeneous	
<b>PLM NYS 198.1 Friable</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>	02/26/2020	Brown		100.00% Other	<b>Inconclusive: None Detected</b>
Final Residue <1% of original subsample					
<b>TEM NYS 198.4 NOB</b>	02/27/2020	Brown		100.00% Other	<b>None Detected</b>
<b>Sample ID</b> 3217-71-Adhesive 032003794-0009A			<b>Description</b>	BOYS LOCKER ROOM, ON CEMENTITIOUS BLOCK WALL - COVE BASE MOLDING & ADHESIVE	
			<b>Homogeneity</b>	Heterogeneous	
<b>PLM NYS 198.1 Friable</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>	02/26/2020	Yellow		100.00% Other	<b>Inconclusive: None Detected</b>
<b>TEM NYS 198.4 NOB</b>	02/27/2020	Yellow		100.00% Other	<b>None Detected</b>
<b>Sample ID</b> 3217-72-Cove Base 032003794-0010			<b>Description</b>	BOYS LOCKER ROOM, ON CEMENTITIOUS BLOCK WALL - COVE BASE MOLDING & ADHESIVE	
			<b>Homogeneity</b>	Homogeneous	
<b>PLM NYS 198.1 Friable</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>	02/26/2020	Brown		100.00% Other	<b>Inconclusive: None Detected</b>
Final Residue <1% of original subsample					
<b>TEM NYS 198.4 NOB</b>	02/27/2020	Brown		100.00% Other	<b>None Detected</b>

Initial report from: 02/27/2020 10:47:47



# EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

Tel/Fax: (212) 290-0051 / (212) 290-0058

<http://www.EMSL.com / manhattanlab@emsl.com>

EMSL Order: 032003794

Customer ID: QUES51

Customer PO:

Project ID:

## Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
Sample ID 3217-72-Adhesive 032003794-0010A			Description BOYS LOCKER ROOM, ON CEMENTITIOUS BLOCK WALL - COVE BASE MOLDING & ADHESIVE Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	02/26/2020	Yellow		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	02/27/2020	Yellow		100.00% Other	None Detected
Sample ID 3217-73 032003794-0011			Description GIRLS LOCKER ROOM, WINDOW, METAL TRIM TO CEMENTITIOUS BLOCK FAÇADE - CAULK Homogeneity Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	02/26/2020	Gray		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	02/27/2020	Gray		100.00% Other	None Detected
Sample ID 3217-74 032003794-0012			Description GIRLS LOCKER ROOM, WINDOW, METAL TRIM TO CEMENTITIOUS BLOCK FAÇADE - CAULK Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	02/26/2020	Gray		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	02/27/2020	Gray		100.00% Other	None Detected
Sample ID 3217-75 032003794-0013			Description GIRLS LOCKER ROOM, BATHROOM, AROUND SINK - CAULK Homogeneity Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	02/26/2020	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	02/27/2020	White		100.00% Other	None Detected
Sample ID 3217-76 032003794-0014			Description GIRLS LOCKER ROOM, BATHROOM, AROUND SINK - CAULK Homogeneity Homogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	02/26/2020	White		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	02/27/2020	White		100.00% Other	None Detected
Sample ID 3217-77 032003794-0015			Description BOYS LOCKER ROOM, BATHROOM, FLOOR, ON CERAMIC TILE, UNDER FLOOR TILE - MASTIC Homogeneity Heterogeneous		
PLM NYS 198.1 Friable					Not Analyzed
PLM NYS 198.6 VCM					Not Analyzed
PLM NYS 198.6 NOB	02/26/2020	Black		100.00% Other	Inconclusive: None Detected
TEM NYS 198.4 NOB	02/27/2020	Black		100.00% Other	None Detected

Initial report from: 02/27/2020 10:47:47



# EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

Tel/Fax: (212) 290-0051 / (212) 290-0058

<http://www.EMSL.com> / [manhattanlab@emsl.com](mailto:manhattanlab@emsl.com)

**EMSL Order:** 032003794  
**Customer ID:** QUES51  
**Customer PO:**  
**Project ID:**

## Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos		Asbestos
			Fibrous	Non-Fibrous	
<b>Sample ID</b> 3217-78 <i>032003794-0016</i>		<b>Description</b>	BOYS LOCKER ROOM, BATHROOM, FLOOR, ON CERAMIC TILE, UNDER FLOOR TILE - MASTIC		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>	02/26/2020	Black		100.00% Other	<b>Inconclusive: None Detected</b>
<b>TEM NYS 198.4 NOB</b>	02/27/2020	Black		100.00% Other	<b>None Detected</b>
<b>Sample ID</b> 3217-79 <i>032003794-0017</i>		<b>Description</b>	BOYS LOCKER ROOM, BATHROOM, FLOOR, ON CERAMIC TILE, 1'X1' - FLOOR TILE		
		<b>Homogeneity</b>	Heterogeneous		
<b>PLM NYS 198.1 Friable</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>	02/26/2020	Gray		100.00% Other	<b>Inconclusive: None Detected</b>
<b>TEM NYS 198.4 NOB</b>	02/27/2020	Gray		100.00% Other	<b>None Detected</b>
<b>Sample ID</b> 3217-80 <i>032003794-0018</i>		<b>Description</b>	BOYS LOCKER ROOM, BATHROOM, FLOOR, ON CERAMIC TILE, 1'X1' - FLOOR TILE		
		<b>Homogeneity</b>	Homogeneous		
<b>PLM NYS 198.1 Friable</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 VCM</b>					<b>Not Analyzed</b>
<b>PLM NYS 198.6 NOB</b>	02/26/2020	Gray		100.00% Other	<b>Inconclusive: None Detected</b>
<b>TEM NYS 198.4 NOB</b>	02/27/2020	Gray		100.00% Other	<b>None Detected</b>

Initial report from: 02/27/2020 10:47:47



# EMSL Analytical, Inc.

307 West 38th Street New York, NY 10018

Tel/Fax: (212) 290-0051 / (212) 290-0058

<http://www.EMSL.com> / [manhattanlab@emsl.com](mailto:manhattanlab@emsl.com)

<b>EMSL Order:</b> 032003794
<b>Customer ID:</b> QUES51
<b>Customer PO:</b>
<b>Project ID:</b>

## Test Report:Asbestos Analysis of Bulk Material

The samples in this report were submitted to EMSL for analysis by Asbestos Analysis of Bulk Materials via NYS ELAP Approved Methods. The reference number for these samples is the EMSL Order ID above. Please use this reference number when calling about these samples.

### Report Comments:

Sample Receipt Date: 2/22/2020  
Analysis Completed Date: 2/27/2020

Sample Receipt Time: 9:57 AM  
Analysis Completed Time: 10:09 AM

### Analyst(s):

Krystal Harris PLM NYS 198.6 NOB (19)

Venisha Lazarus-Barnes TEM NYS 198.4 NOB (18)

### Samples reviewed and approved by:

James Hall, Laboratory Manager  
or Other Approved Signatory

NOB = Non Friable Organically Bound N/A = Not Applicable VCM = Vermiculite Containing Material

-In New York State, TEM is currently the only method that can be used to determine if NOB materials can be considered or treated as non-asbestos containing.

All samples examined for the presence of vermiculite when analyzed via NYS 198.1.

-NYS Guidelines for Vermiculite containing samples are available at [http://www.wadsworth.org/labcert/elapcert/forms/VermiculiteInterimGuidance\\_Rev070913.pdf](http://www.wadsworth.org/labcert/elapcert/forms/VermiculiteInterimGuidance_Rev070913.pdf) EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples were received in good condition unless otherwise noted.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. This report may contain data that is not covered by the NVLAP accreditation.

Samples analyzed by EMSL Analytical, Inc. New York, NY NYS ELAP 11506

Initial report from: 02/27/2020 10:47:47

032003794

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

**BULK SAMPLE FORM**

CLIENT: Mount Pleasant CSD  
 ADDRESS: 825 Westlake Dr  
Thornwood, NY 10594  
 CONTACT: Eric Strack  
 PROJECT ID: Westlake HS - Coaches Office/Locker Rooms  
Pre-Demo ASB Survey  
 PROJECT #: Q20-3217

SAMPLED BY: J. Mages, T. Ranadive  
 DATE SAMPLED: 19-Feb-20  
 ANALYSIS METHOD: PLM/NOB/QTEM as Required  
 TURN-AROUND TIME: \_\_\_\_\_ HOURS  
5 DAYS  
 OTHER

EMSL MANHATTAN LAB  
 RECEIVED  
 20 FEB 22 AM 9:57  
 2-24-20

Please contact Greg Dean (gdean@qualityenv.com) if samples test positive for vermiculite

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
3217-63	Girls Coaches Office, Ceiling, 1' x 1', Splined	Ceiling Tile	Stop At First
3217-64	Girls Coaches Office, Ceiling, 1' x 1', Splined	Ceiling Tile	Positive
3217-65	Boys Locker Room, Suspended Ceiling, 2' x 2', Textured Dotted	Ceiling Tile	Stop At First
3217-66	Boys Locker Room, Suspended Ceiling, 2' x 2', Textured Dotted	Ceiling Tile	Positive
3217-67	Boys Locker Room, Suspended Ceiling, 2' x 2', Dotted	Ceiling Tile	Stop At First
3217-68	Girls Locker Room, Suspended Ceiling, 2' x 2', Dotted	Ceiling Tile	Positive
3217-69	Boys Locker Room, Suspended Ceiling, 2' x 2', Dot Canyon	Ceiling Tile	Stop At First
3217-70	Girls Locker Room, Suspended Ceiling, 2' x 2', Dot Canyon	Ceiling Tile	Positive
3217-71	Boys Locker Room, on Cementitious Block Wall	Cove Base Molding & Adhesive (Separate Layers)	Stop At First
3217-72	Boys Locker Room, on Cementitious Block Wall	Cove Base Molding & Adhesive (Separate Layers)	Positive

Please contact Greg Dean (gdean@qualityenv.com) if samples test positive for vermiculite

**CHAIN OF CUSTODY (SEE LAST PAGE)**

SUBMITTED BY: [Signature]

DATE: 2/21/2020

RECEIVED BY: [Signature]

DATE: 2/22/20 9:57 AM

  
 Page 1 Of 2 - 2/27/2020

032003794

QUALITY ENVIRONMENTAL SOLUTIONS & TECHNOLOGIES, INC.

**BULK SAMPLE FORM**

CLIENT: Mount Pleasant CSD  
 ADDRESS: 825 Westlake Dr  
Thornwood, NY 10594  
 CONTACT: Eric Strack  
 PROJECT ID: Westlake HS - Coaches Office/Locker Rooms  
Pre-Demo ASB Survey  
 PROJECT #: Q20-3217

SAMPLED BY: J. Mages, T. Ranadive  
 DATE SAMPLED: 19-Feb-20  
 ANALYSIS METHOD: PLM/NOB/QTEM as Required  
 TURN-AROUND TIME: \_\_\_\_\_ HOURS  
5 DAYS  
 OTHER \_\_\_\_\_

EMSL MANHATTAN LAB  
 RECEIVED  
 20 FEB 22 AM 9:57

Please contact Greg Dean (gdean@qualityenv.com) if samples test positive for vermiculite

SAMPLE # LAB#	LOCATION	SAMPLE DESCRIPTION	COMMENTS
3217-73	Girls Locker Room, Window, Metal Trim to Cementitious Block Façade	Caulk	Stop At First
3217-74	Girls Locker Room, Window, Metal Trim to Cementitious Block Façade	Caulk	Positive
3217-75	Girls Locker Room, Bathroom, Around Sink	Caulk	Stop At First
3217-76	Girls Locker Room, Bathroom, Around Sink	Caulk	Positive
3217-77	Boys Locker Room, Bathroom, Floor, on Ceramic Tile, Under Floor Tile	Mastic	Stop At First
3217-78	Boys Locker Room, Bathroom, Floor, on Ceramic Tile, Under Floor Tile	Mastic	Positive
3217-79	Boys Locker Room, Bathroom, Floor, on Ceramic Tile, 1' x 1'	Floor Tile	Stop At First
3217-80	Boys Locker Room, Bathroom, Floor, on Ceramic Tile, 1' x 1'	Floor Tile	Positive

Please contact Greg Dean (gdean@qualityenv.com) if samples test positive for vermiculite

**CHAIN OF CUSTODY (SEE LAST PAGE)**

SUBMITTED BY: [Signature]  
 RECEIVED BY: [Signature]

DATE: 2/21/2020  
 DATE: 2/22/20 9:57 AM

  
2/21/2020



Quality Environmental Solutions & Technologies, Inc.

## **Appendix C: PERSONNEL LICENSES & CERTIFICATIONS**

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1376 Route 9, Wappingers Falls, NY 12590 Phone (845) 298-6031 Fax (845) 298-6251

NYS MWBD MBE Cert # 49952-2006 NYSUCP DBE Certified NJUCP DBE Certified [www.Qualityenv.com](http://www.Qualityenv.com)

**New York State – Department of Labor**

Division of Safety and Health  
License and Certificate Unit  
State Campus, Building 12  
Albany, NY 12240

**ASBESTOS HANDLING LICENSE**

Quality Environmental Solutions & Technologies, Inc.

1376 Route 9

Wappinger Falls, NY 12590

FILE NUMBER: 99-0018

LICENSE NUMBER: 29085

LICENSE CLASS: RESTRICTED

DATE OF ISSUE: 01/17/2020

EXPIRATION DATE: 01/31/2021

Duly Authorized Representative – Lawrence J Holzapfel:

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.



Eileen M. Franko, Director  
For the Commissioner of Labor



**NEW YORK STATE**  
MINORITY- AND WOMEN-OWNED BUSINESS  
ENTERPRISE ("MWBE")  
**CERTIFICATION**

Empire State Development's Division of Minority and Women's Business  
Development grants a

**Women Business Enterprise (WBE)**

pursuant to New York State Executive Law, Article 15-A to:

**Quality Environmental Solutions & Technologies Inc.**

**Certification Awarded on:** March 28, 2019

**Expiration Date:** March 28, 2022

**File ID#:** WBE- 49952



Division of Minority  
and Women's  
Business Development

A Division of Empire State Development

NEW YORK STATE DEPARTMENT OF HEALTH  
WADSWORTH CENTER



Expires 12:01 AM April 01, 2020  
Issued April 01, 2019

**CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE**

*Issued in accordance with and pursuant to section 502 Public Health Law of New York State*

MR. JAMES HALL  
EMSL ANALYTICAL, INC  
307 WEST 38TH STREET SUITE 901  
NEW YORK, NY 10018

NY Lab Id No: 11506

*is hereby APPROVED as an Environmental Laboratory for the category  
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE  
All approved subcategories and/or analytes are listed below:*

**Miscellaneous**

Asbestos in Friable Material	Item 198.1 of Manual EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual
Asbestos-Vermiculite-Containing Material	Item 198.8 of Manual



Serial No.: 59684

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

STATE OF NEW YORK - DEPARTMENT OF LABOR  
ASBESTOS CERTIFICATE

N.Y.S



TANAY RANADIVE  
CLASS(EXPIRES)  
C ATEC(06/20) D INSP(06/20)  
H PM (06/20)

CERT# 15-10696  
DMV# 859664473

MUST BE CARRIED ON ASBESTOS PROJECTS



01213 005007143 06

EYES BRO  
HAIR BLK  
HGT 5' 10"

IF FOUND RETURN TO:  
NYS DOL - L&C UNIT  
ROOM 161A BUILDING 12  
STATE OFFICE CAMPUS  
ALBANY NY 12240



12-005398747

This card acknowledges that the recipient has successfully completed a  
10-hour Occupational Safety and Health Training Course in  
**Construction Safety and Health**

**Tanay Ranadive**

David Veit

06/05/2015

Trainer name – print or type

(Course and date)

OSHA recommends Outreach Training Courses as an orientation to occupational safety and health for workers. Participation is voluntary. Workers must receive additional training on specific hazards of their job. This course completion card does not expire.

Use or distribution of this card for fraudulent purposes, including false claims of having received training, may result in prosecution under 18 U.S.C. 1001. Potential penalties include substantial criminal fines, imprisonment up to five years, or both.

For more information on OSHA Outreach Training Program go to "Training" at [www.osha.gov](http://www.osha.gov)

STATE OF NEW YORK - DEPARTMENT OF LABOR  
ASBESTOS CERTIFICATE

N.Y.S.



**JONATHAN R MAGES**  
CLASS(EXPIRES)  
C ATEC(01/21) D INSP(01/21)  
H PM (01/21)

CERT# 18-53364  
DMV# 345648492

MUST BE CARRIED ON ASBESTOS PROJECTS



01213 005237340 42

EYES HAZ  
HAIR BRO "  
HGT 5' 10"

IF FOUND RETURN TO:  
NYS DOL - L&C UNIT  
ROOM 161A BUILDING 12  
STATE OFFICE CAMPUS  
ALBANY NY 12240



11-006052324

This card acknowledges that the recipient has successfully completed:

**10-hour Construction Safety and Health**

This card issued to:

**Jonathan Mages**

**Paul Rodriguez**

Trainer Name

**6/6/2018**

Date of Issue



800-449-6742  
outreach.keeneosha.com

OSHA recommends Outreach Training Courses as an orientation to occupational safety and health for workers. Participation is voluntary. Workers must receive additional training on specific hazards of their job. This course completion card does not expire.

Use or distribution of this card for fraudulent purposes, including false claims of having received training, may result in prosecution under 18 U.S.C. 1001. Potential penalties include substantial criminal fines, imprisonment up to 5 years, or both.



To verify this training, scan the QR code with your mobile device.

Rev. 1/2016



Quality Environmental Solutions & Technologies, Inc.

# **PRE-DEMOLITION XRF LEAD-BASED PAINT INSPECTION**

**For**

**Mount Pleasant CSD  
825 Westlake Drive  
Thornwood, NY 10594**

**At**

**Westlake High School  
(Gym Locker Rooms & Coach's Office)  
825 Westlake Drive  
Thornwood, NY 10594**

**Project #Q20-3217**

# QuES&T

Quality Environmental Solutions & Technologies, Inc.

March 13, 2020

Mount Pleasant CSD  
825 Westlake Drive  
Thornwood, NY 10594

**ATTN: Eric Strack**

Via Email: [estrack@mtplcsd.org](mailto:estrack@mtplcsd.org)

Re: Westlake HS (Gym Locker Rooms & Coach's Office) –  
825 Westlake Drive, Thornwood NY 10594  
XRF Lead Survey  
**QuES&T** Project #Q20-3217

Dear Mr. Strack,

**Quality Environmental Solutions & Technologies, Inc. (QuES&T)** was retained by Mount Pleasant CSD to complete a Pre-Demolition Lead-Based Paint Survey, utilizing X-Ray Fluorescence Technology (XRF), throughout the interiors of Westlake HS, gym locker rooms and coach's office, located at 825 Westlake Drive, Thornwood NY 10594. The survey was limited to specific accessible, representative building components & immovable objects, potentially affected by possible future demolition/renovation activities.

We appreciate the opportunity to provide environmental services for this project and look forward to working again with Mount Pleasant CSD in the future. If you have any questions or require further information, feel free to contact our office at your earliest convenience.

Sincerely,



**Tanay Ranadive**  
Field and Technical Services  
NYS AHERA Inspector  
Cert. #AH 15-10696  
NYS Mold Assessor

Cc. [gdean@qualityenv.com](mailto:gdean@qualityenv.com)  
QuES&T File

# QuES&T

Quality Environmental Solutions & Technologies, Inc.

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  - 4.2.1 Identified Lead-Based Paint
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- 5.2 Renovation Requirements
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- B. Radiation, XRF Spectrum Analyzer & Personnel Certifications

## **1.0 SUMMARY**

Quality Environmental Solutions & Technologies, Inc. (**QuES&T**) was retained by Mount Pleasant CSD to complete a Pre-Demolition XRF Inspection for Lead-Based Paint(s), and/or Lead-containing materials, utilizing X-ray Fluorescence Technology (XRF) throughout (inactive) building at 825 Westlake Drive, Thornwood NY 10594.

This report should be read in its entirety, including the detailed information and XRF data tables contained in other sections and appendices.

The XRF Lead Survey conducted throughout accessible, interior demolition areas, mentioned above, located at 825 Westlake Drive, Thornwood NY 10594, and was conducted by Niton-certified XRF Technician Mr. Jonathan Mages, of **QuES&T**, on February 19<sup>th</sup>, 2020. The survey included accessible interior building components and immovable objects to identify the presence of Lead-Based Paint (LBP) and/or Lead-containing Materials in compliance with the HUD/EPA Guidelines potentially affected by scheduled renovation/demolition work. No prior sampling, data or documentation was utilized as part of the survey. All surfaces were located and categorized by homogeneous painting histories and component types. A total of thirty-nine (**39**) samples were taken (including calibrations).

Two locations were identified as having lead-based paints above the EPA/HUD thresholds.

This report has been prepared for the exclusive use of Mount Pleasant Central School District.

## **2.0 INTRODUCTION**

### **2.1 PURPOSE**

The purpose of this Lead-Based Paint inspection was to provide Mount Pleasant CSD with a detailed report that includes the location, condition and substrate of Lead-Based Paint(s), and/or Lead-containing materials, throughout accessible interiors of the gym locker rooms and coach's office located at Westlake High School: 825 Westlake Drive, Thornwood, NY 10594. This objective included the following issues:

- Physical inspection of all accessible building components for suspect lead-based paint.
- Group the suspect areas by component types and similar painting histories.
- Analyze the suspect lead-based paint via X-ray Fluorescence Technology utilizing a Niton XLp-300A Serial #102273 in accordance with the EPA issued Performance Characteristics Sheet (PCS).
- Compile information into a report format.
- Summarize the applicable Federal, State and Local regulations that apply to the facility.
- Summarize the impact of these regulations on the building owner.

### **2.2 WARRANTY**

The information contained in this report is based upon observation and test results provided by **QuES&T**. These observations and results are time dependent, subject to changing site conditions and revisions to Federal, State, and Local regulations. **QuES&T** warrants that these findings have been promulgated after being prepared in general accordance with generally accepted practices in the Lead-Based Paint testing and abatement industries. **QuES&T** also recognizes that raw testing data is not usually enough to make all abatement and management decisions. No other warranties are expressed or implied.

## **3.0 SCOPE OF SERVICES**

A Pre-Demolition XRF Inspection for Lead-Based Paint(s), and/or Lead-containing materials, was performed throughout accessible interiors of the gym locker rooms and coach's office of Westlake HS as outlined within Section #1.0. The inspection was completed in conformance with the client's (Mount Pleasant CSD) specific requests.

All suspect areas were analyzed utilizing a Niton XLp-300A XRF Spectrum Analyzer in conformance with the EPA Performance Characteristics Sheet (PCS) as required by 29 CFR 1926.62 and 40 CFR Part 745. Proper use of the Niton XLp-300A XRF Spectrum Analyzer does not require substrate correction or back up paint chip testing, as there is no inconclusive range for the instrument per the Performance Characteristics Sheet. The data generated from this testing is in the Findings Section of this report. Appropriately trained and/or certified personnel performed the lead-based paint inspection. Copies of training are in the Appendices Section of this report.

## **4.0 FINDINGS**

### **4.1 OVERVIEW**

Two items were identified as Lead-based paint(s) within specific accessible interiors areas and associated immovable building components.

In 1972, the Consumer Product Safety Commission limited the concentration of lead in new residential paint to 0.5% by weight (5000ppm) and in 1978, to 0.06% by weight (600ppm). The EPA defines lead-based paint as "...paint or other surface coating that contain lead equal to or in excess of 1.0 milligram per square centimeter or 0.5% by weight." (40 CFR 745.223) August 29, 1996. OSHA regulations 29 CFR 1926.62, Lead Exposure In Construction; Interim Final Rule published in the Federal Register May 4, 1993, effective June 3, 1993 do not specify a minimum concentration of lead which triggers a determination that lead is present as indicated in OSHA Instruction CPL 2-2.58, Office of Health Compliance Assistance, U.S. Department of Labor.

### **4.2 DISCUSSION OF FINDINGS**

Based on review of the data generated from the Niton XLp-300A XRF Spectrum Analyzer, two items were identified as Lead-based paint(s).

#### **4.2.1 IDENTIFIED LEAD-BASED PAINT(S)**

<b><u>Location of Identified LBP</u></b>	<b><u>LBP Component</u></b>	<b><u>Substrate</u></b>	<b><u>Color</u></b>	<b><u>LBP Condition</u></b>
Boy's Locker Room, Back Room	Wall, Floors	Ceramic Tile	Yellow	Intact
Boy's Locker Room, Closet	Slop Sink	Metal	White	Fair

- Additionally, it should be noted that a few components tested did in fact contain minimal lead levels, below the EPA threshold level of 1.0 mg/sq. cm. for classification as Lead-Based Paint (LBP) and are considered lead-containing coatings by the OSHA Regulation, "Lead Exposure in Construction" (29 CFR 1926.62). OSHA does not recognize a minimum limit for lead concentrations in paint for the purposes of disturbance. Monitoring of workers performing demolition/cleaning/disturbance of painted surfaces shall be completed to document personnel occupational exposure. Items containing any amount of lead concentration are considered lead-containing coatings per 29 CFR 1926.62, OSHA Lead Exposure in Construction.

#### **4.2.2 IDENTIFIED LEAD-CONTAINING COATINGS**

As indicated above in Section 4.1 Overview, OSHA does not recognize a limit for the concentration of lead in paint for the purpose of disturbance. As almost all paint contains some amount of lead, monitoring of workers performing demolition/cleaning of the area should be completed in order to document personnel exposure. Items containing any amount of lead concentration are considered lead-containing coatings per 29 CFR 1926.62, OSHA Lead Exposure in Construction.

## **5.0 REGULATORY REQUIREMENTS**

### **5.1 REGULATORY OVERVIEW**

Projects involving the disturbance of lead and/or lead-based paints at the gym locker room and coach's office of Westlake High School, must conform to the following at a minimum:

**OSHA 29 CFR 1926.62 Lead Exposure in Construction:** The OSHA regulation applies to all alteration, repair, or renovation projects where lead is present. Regulations establish a Permissible Exposure Level for workers, exposure assessment requirements, methods of compliance, medical monitoring and removal, training, respiratory protection and other protections.

**OSHA 29 CFR 1910.134:** Respiratory Protection Standard applies where respirators are required to reduce lead exposures below the OSHA PEL and Action Limit.

**OSHA 29 CFR 1910.1910.1025:** Lead Standard applies to workers governed by the general industry standard.

**49 CFR Part 171 and 172:** Regulates the transport of lead waste for disposal.

**40 CFR Part 261-265, RCRA:** Requires testing of wastes to determine whether debris is hazardous or non-hazardous and further regulates facilities which may accept or process hazardous wastes.

**NYCRR Part 364:** New York State Department of Environmental Conservation regulation that requires permitting of transporters carrying hazardous lead-containing wastes.

## 5.2 ABATEMENT REQUIREMENTS

Under the existing regulations, facility maintenance staff may perform abatement, paint stabilization and lead-based paint chip clean-up if the following criteria are met:

- Employees who disturb or contact lead-based paint must receive Lead-Based Paint Awareness Training commensurate with the type of work being performed in conformance with 29 CFR 1926.62 (OSHA Lead Exposure in Construction).
- Employees exposed above the Action Level of 30 ug/m<sup>3</sup> of air must receive medical monitoring including blood lead testing in accordance with 29 CFR 1926.62.
- Employees exposed above the Permissible Exposure Limit of 50 ug/m<sup>3</sup> of air (8-hour work shift) must utilize respirators in accordance with 29 CFR 1910.134 (OSHA Respiratory Protection Standard) including annual fit testing and medical monitoring.
- Personnel must wear personal protective equipment including, at a minimum, a half-mask negative air pressure respirator, disposable coveralls, and rubber gloves until an initial exposure assessment is completed. Some work practices require the use of specific respirators until a negative exposure assessment is completed. Upon completion of the initial exposure assessment, personal protective equipment shall be utilized as required by the results of the initial exposure assessment (29 CFR 1926.62).
- Employees must establish and utilize decontamination and/or hygiene facilities in accordance with 29 CFR 1926.62 (i).
- Areas where lead-based paint and lead-containing coating disturbance is occurring shall be restricted to trained individuals and posted in accordance with 29 CFR 1926.62 (m) (2).
- Disturbance or abatement of lead-based paint/lead-containing coatings must be supervised by a competent person as defined by 29 CFR 1926.62.
- A written work plan shall be compiled and maintained in accordance with 29 CFR 1926.62 (e) (2).
- Containerization, testing, storage, transportation, and disposal of lead-based paint debris and lead containing waste shall be completed in accordance with all applicable Federal, State and Local regulations.

### 5.3 GENERAL REQUIREMENTS

Under the existing regulations, the following items are required for daily operations in buildings that have lead-based paint.

- All construction personnel as well as individuals who have access to locations where lead-based paint or lead containing coatings exist should be informed of its presence and the proper work practices in these areas.
- Conspicuous labeling of all lead-based paint is suggested to ensure personnel are adequately informed.
- Personnel should be informed not to rest, lean or store material or equipment on or near these surfaces and not to cut, saw, drill, sand or disturb lead-based paint.
- Facility custodial, maintenance and other personnel that contact lead-based paint coated surfaces should receive lead awareness training at a minimum in conformance with 29 CFR 1926.62
- All removal, disturbance and repair of lead-based paint or lead containing coatings should be performed in compliance with 29 CFR 1926.62, Lead Exposure in Construction; by persons properly trained to handle lead containing paint.



Quality Environmental Solutions & Technologies, Inc.

## **APPENDIX A: ANALYTICAL DATA**

**XRF Lead Survey**

Sample	Building/Address	Interior/Exterior	Floor	Space/Room/Description	Object	Component	Substrate	Color	Condition	Result	Pb Concentration (mg/cm <sup>2</sup> )	Pb Error (mg/cm <sup>2</sup> )
1	Shutter Calibration									Negative	0	0.02
2	NIST (<0.01)									<b>Positive</b>	<b>1.1</b>	<b>0.1</b>
<b>3</b>	<b>NIST (1.04 +/- 0.06)</b>									Negative	0	0.02
4	Westlake High School	Interior	1	Girls Locker Room	Floor		Ceramic	Glazed Blue	Intact	Negative	0	0.02
5	Westlake High School	Interior	1	Girls Locker Room	Wall		CMU Block	White	Intact	Negative	0	0.02
6	Westlake High School	Interior	1	Girls Locker Room	Locker		Metal	Tan	Fair	Negative	0.01	0.04
7	Westlake High School	Interior	1	Girls Locker Room	Heater		Metal	White	Fair	Negative	0.05	0.1
8	Westlake High School	Interior	1	Girls Locker Room	Wall	Base	Ceramic	Glazed Tan	Fair	Negative	0	0.02
9	Westlake High School	Interior	1	Girls Locker Room	Window	Case	Metal	Blue	Fair	Negative	0	0.02
10	Westlake High School	Interior	1	Girls Bathroom	Sink		Ceramic	Glazed White	Fair	Negative	0.01	0.05
11	Westlake High School	Interior	1	Girls Bathroom	Partition		Metal	White	Fair	Negative	0.07	0.15
12	Westlake High School	Interior	1	Girls Bathroom	Toilet		Ceramic	Glazed White	Fair	Negative	0.01	0.05
13	Westlake High School	Interior	1	Girls Shower	Wall		Ceramic	Glazed Pink	Fair	Negative	0.7	0.1
14	Westlake High School	Interior	1	Girls Shower	Floor		Ceramic	Glazed Pink	Fair	Negative	0.12	0.29
15	Westlake High School	Interior	1	Girls Shower	Heater		Metal	Yellow	Poor	Negative	0.04	0.06
16	Westlake High School	Interior	1	Girls Shower	Ceiling		Plaster	White	Fair	Negative	0	0.02
17	Westlake High School	Interior	1	Girls Coaches Office	Floor		Ceramic	Glazed Tan	Fair	Negative	0	0.02
18	Westlake High School	Interior	1	Girls Coaches Office	Wall	Upper	CMU Block	Tan	Fair	Negative	0	0.02
19	Westlake High School	Interior	1	Girls Coaches Office	Wall	Lower	CMU Block	Speckled	Fair	Negative	0	0.02
20	Westlake High School	Interior	1	Girls Coaches Office	Heater		Metal	Tan	Fair	Negative	0.04	0.07
21	Westlake High School	Interior	1	Girls Coaches Office	Door	Case	Metal	Blue	Fair	Negative	0.06	0.11
22	Westlake High School	Interior	1	Girls Coaches Office	Bathroom Floor		Ceramic	Glazed Blue	Fair	Negative	0	0.02
23	Westlake High School	Interior	1	Girls Coaches Office	Bathroom Wall		CMU Block	Brown	Fair	Negative	0	0.02
24	Westlake High School	Interior	1	Boy's Locker Room	Wall		CMU Block	White	Fair	Negative	0	0.02
25	Westlake High School	Interior	1	Boy's Locker Room	Lockers	Covebase	Metal	Blue	Fair	Negative	0	0.02
26	Westlake High School	Interior	1	Boy's Locker Room	Wall		Glazed Block	Blue	Fair	Negative	0	0.02
27	Westlake High School	Interior	1	Boy's Locker Room	Office Window	Case	Metal	White	Fair	Negative	0	0.02
28	Westlake High School	Interior	1	Bathroom	Sink		Glazed Porcelain	White	Fair	Negative	0.01	0.04
29	Westlake High School	Interior	1	Bathroom	Urinal		Glazed Porcelain	White	Fair	Negative	0.02	0.1
30	Westlake High School	Interior	1	Bathroom	Ceiling		Plaster	White	Fair	Negative	0	0.02
31	Westlake High School	Interior	1	Bathroom	Bathroom Stall	Partition Wall	Metal	White	Fair	Negative	0	0.02
32	Westlake High School	Interior	1	Bathroom	Water Pipe		Metal	White	Fair	Negative	0.02	0.07
33	Westlake High School	Interior	1	Bathroom	Floor		Ceramic Tile	White	Fair	Negative	0	0.02
34	Westlake High School	Interior	1	Bathroom	Wall		CMU Block	Blue	Fair	Negative	0	0.02
<b>35</b>	<b>Westlake High School</b>	<b>Interior</b>	<b>1</b>	<b>Boy's Back Room</b>	<b>Wall</b>		<b>Ceramic Tile</b>	<b>Yellow</b>	<b>Intact</b>	<b>Positive</b>	<b>1.2</b>	<b>0.2</b>
<b>36</b>	<b>Westlake High School</b>	<b>Interior</b>	<b>1</b>	<b>Boys Locker Room Closet</b>	<b>Slop Sink</b>		<b>Metal</b>	<b>White</b>	<b>Fair</b>	<b>Positive</b>	<b>6.1</b>	<b>4.2</b>
37	Westlake High School	Interior	1	Boys Locker Room Storage	Door		Metal	Blue	Fair	Negative	0	0.02
38	NIST (<0.01)									Negative	0	0.02
<b>39</b>	<b>NIST (1.04 +/- 0.06)</b>									<b>Positive</b>	<b>1.2</b>	<b>0.2</b>



Quality Environmental Solutions & Technologies, Inc.

**APPENDIX B:  
RADIATION, XRF SPECTRUM ANALYZER  
& PERSONNEL CERTIFICATIONS**



**NEW YORK STATE**  
MINORITY- AND WOMEN-OWNED BUSINESS  
ENTERPRISE ("MWBE")  
**CERTIFICATION**

Empire State Development's Division of Minority and Women's Business  
Development grants a

**Women Business Enterprise (WBE)**

pursuant to New York State Executive Law, Article 15-A to:

**Quality Environmental Solutions & Technologies Inc.**

**Certification Awarded on:** March 28, 2019

**Expiration Date:** March 28, 2022

**File ID#:** WBE- 49952



Division of Minority  
and Women's  
Business Development

A Division of Empire State Development

# United States Environmental Protection Agency

This is to certify that



Quality Environmental Solutions & Technologies, Inc

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint renovation, repair, and painting activities pursuant to 40 CFR Part 745.89

In the Jurisdiction of:

All EPA Administered States, Tribes, and Territories

This certification is valid from the date of issuance and expires December 01, 2021

NAT-119213-2

Certification #

December 01, 2016

Issued On

A handwritten signature in black ink that reads "Michelle Price".

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch



# United States Environmental Protection Agency

This is to certify that

Quality Environmental Solutions & Technologies, Inc

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received accreditation to conduct lead-based paint training pursuant to 40 CFR Part 745.225 in the following discipline:

Renovator - Refresher (English)

## In the Jurisdiction of:

All EPA Administered States, Tribes, and Territories

This accreditation is valid from the date of issuance and expires August 29, 2022

NAT-RV-R-30640-3-EN

Accreditation #

August 29, 2018

Issued On



John Gorman, Chief

Pesticides & Toxic Substances Branch





11-006052324

This card acknowledges that the recipient has successfully completed:

**10-hour Construction Safety and Health**

This card issued to:

**Jonathan Mages**

**Paul Rodriguez**

Trainer Name

**6/6/2018**

Date of Issue



800-449-6742  
outreach.keeneosha.com

OSHA recommends Outreach Training Courses as an orientation to occupational safety and health for workers. Participation is voluntary. Workers must receive additional training on specific hazards of their job. This course completion card does not expire.

Use or distribution of this card for fraudulent purposes, including false claims of having received training, may result in prosecution under 18 U.S.C. 1001. Potential penalties include substantial criminal fines, imprisonment up to 5 years, or both.



To verify this training, scan the QR code with your mobile device.

Rev. 1/2016

# Certificate of Completion

This is to certify that

**Jonathan Mages**

Has completed the

**US Regulations for Handheld XRF Analyzers with Radioactive Sealed Sources**

Online training course

On

10/30/2018

Supervisor signature



Erin Poitras, RSO Thermo Fisher Scientific  
Portable Analytical Instruments



# Certificate of Completion

This is to certify that

**Jonathan Mages**

Has completed the

**Sealed Source XRF - Radiation Safety**

Online training course

On

10/30/2018

Supervisor signature



Erin Poitras, RSO Thermo Fisher Scientific  
Portable Analytical Instruments



# Certificate of Completion

This is to certify that

**Jonathan Mages**

Has completed the  
**Transport of Li Ion Batteries**  
Online training course

On  
10/30/2018



Supervisor signature



Erin Poitras, RSO Thermo Fisher Scientific  
Portable Analytical Instruments



# Certificate of Completion

This is to certify that

**Jonathan Mages**

Has completed the

**Transport of Radioactive Sealed Sources in XRF Analyzers**

Online training course

On

10/30/2018



Supervisor signature



Erin Poitras, RSO Thermo Fisher Scientific  
Portable Analytical Instruments



# Certificate of Completion

This is to certify that

**Jonathan Mages**

Has completed the

**Radiation Safety for X-ray Tube Based Instruments**

Online training course

On

10/30/2018

Supervisor signature



Erin Poitras, RSO Thermo Fisher Scientific  
Portable Analytical Instruments





**Sexual Harassment Prevention Certification Form**

By submission of this bid, the person signing on behalf of the bidder certifies, under penalty of perjury, that: the bidder has and has implemented a written policy addressing sexual harassment prevention in the workplace; the bidder provides annual sexual harassment prevention training to all of its employees; and that the principal(s) and all employees of the bidder have completed the sexual harassment prevention training in the last twelve (12) months. Such policy shall, at a minimum, meet the requirements of Section 201-g of the Labor Law.

Bidder Name: \_\_\_\_\_

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

Print Name and Title: \_\_\_\_\_

Signature: \_\_\_\_\_

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

Sworn to before me this \_\_\_\_\_

day of \_\_\_\_\_, 20\_\_\_\_

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



**INSURANCE COVERAGE CERTIFICATION**

\_\_\_\_\_ (name), President/CEO/Owner/Managing Member of  
\_\_\_\_\_ (bidder), hereby deposes and says that the bidder currently has, or immediately upon being awarded the contract, will obtain insurance coverage, from an insurer licensed and admitted to do business in New York, that meets the following requirements:

1. Workers' Compensation and Disability:

Coverage	Statutory
Extensions	Voluntary compensation All states coverage employers Employer's liability - unlimited

2. Commercial General and Umbrella Liability

Coverage	Occurrence using ISO occurrence Form CG 00 01 07 98 or later form
Limits per project	General Aggregate - \$2,000,000.00 on a per project basis Products - Completed/Operations - \$2,000,000.00 Personal & Advertising Injury - \$1,000,000.00 Fire Damage (any one fire) - \$100,000.00 Medical Expenses (any one person) - \$10,000.00 Owners and Contractors Protective Liability Insurance:

- a. \$2,000,000 per occurrence, \$4,000,000 general aggregate for contracts greater than \$1,000,000, or any contracts involving scaffolds or work above a height of one story.
- b. \$1,000,000 per occurrence, \$2,000,000 general aggregate for contracts less than or equal to \$1,000,000 that do not involve scaffolds or work above a height of one story.

Excess Liability (excess coverage shall be on a follow-form basis):

- a. \$10,000,000 for contracts greater than \$1,000,000, or any contracts involving scaffolds or work above a height of one story.
- b. \$5,000,000 for contracts less than or equal to \$1,000,000 that do not involve scaffolds or work above a height of one story.

3. Automobile Liability (all vehicles hired or non-hired): \$1,000,000.00 per accident



4. If this project requires the removal of asbestos and/or hazardous materials, Contractors shall provide hazardous material liability insurance as follows:

\$2,000,000 per occurrence/\$2,000,000 aggregate, including products and completed operations. Such insurance shall include coverage for the Contractor's operations including, but not limited to, removal, replacement enclosure, encapsulation and/or disposal of asbestos, or any other hazardous material, along with any related pollution events, including coverage for third-party liability claims for bodily injury, property damage and clean-up costs. If a retroactive date is used, it shall pre-date the inception of the Contract. If motor vehicles are used for transporting hazardous materials, the Contractor shall provide pollution liability broadened coverage (ISO endorsement CA 9948), as well as proof of MCS 90. Coverage shall fulfill all requirements of this Article 10 and shall extend for a period of three (3) years following acceptance by the District of the Certificate of Completion.

5. Testing Company Errors and Omission Insurance:

\$1,000,000 per occurrence/\$2,000,000 aggregate for the testing and other professional acts of the Contractor performed under the Contract with the Owner.

If written on a "claims-made" basis, the retroactive date must pre-date the inception of the Contract or agreement. Coverage shall remain in effect for two years following the completion of work. The testing company shall also provide proof of Workers' Compensation and NY State Disability Benefits Insurance, Commercial General Liability and Excess Liability with limits of \$2,000,000 each occurrence and in the aggregate.

Print Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Sworn to before me this \_\_\_\_\_

day of \_\_\_\_\_, 20\_\_\_\_\_

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



Section  
No.

FORMS TO BE SUBMITTED WITH BID  
(Submit All Forms With Bid In The Order They Are Listed Below)

004000	Sexual Harassment Prevention Certification Form	<input type="checkbox"/>
004100	Bid Form	<input type="checkbox"/>
004102	Bid Proposal	<input type="checkbox"/>
004390	Surety's Consent	<input type="checkbox"/>
004391	Certificate of Bidder	<input type="checkbox"/>
004392	Qualifications of Bidders	<input type="checkbox"/>
004393	Statement of Bidders Qualifications	<input type="checkbox"/>
004394	Bidder's Personnel	<input type="checkbox"/>
004395	Conflict of Interest Certificate	<input type="checkbox"/>
004396	Form of Disclosure Certificate	<input type="checkbox"/>
004397	Non-Collusion Affidavit	<input type="checkbox"/>
004398	Certification of Compliance with the Iran Divestment Act	<input type="checkbox"/>
004399	Declaration of Bidder's Inability to Provide Certification of Compliance with the Iran Divestment Act	<input type="checkbox"/>
004503	Insurance Certification Form	<input type="checkbox"/>
004521	Hold Harmless Agreement	<input type="checkbox"/>
006101	Bid Bond	<input type="checkbox"/>

**NOTES:**

1. CONTRACTOR MUST SUPPLY A STREET ADDRESS. POST OFFICE BOX NUMBER IS NOT ACCEPTABLE.
2. ALL PROPOSAL FORMS, CONTRACT DOCUMENTS, ETC. MUST BE COMPLETED AND SIGNED IN BLACK INK ONLY.
3. PLEASE PRINT THE NAME OF ALL SIGNATORY PARTIES UNDER THE SIGNATURE: SPELL OUT NAME IN FULL.
4. AFFIRMATIVE ACTION PROGRAM DOCUMENTATION CAN BE REVIEWED DURING REGULAR BUSINESS HOURS AT MOUNT PLEASANT CENTRAL SCHOOL DISTRICT, THORNWOOD, NEW YORK.
5. WAGE RATE DOCUMENTATION CAN BE REVIEWED DURING REGULAR BUSINESS HOURS AT MOUNT PLEASANT CENTRAL SCHOOL DISTRICT, THORNWOOD, NEW YORK.



BID PROPOSAL

MOUNT PLEASANT CENTRAL SCHOOL DISTRICT

FOR THE **PHYSICAL EDUCATION DEPARTMENT RENOVATIONS AT WESTLAKE HIGH SCHOOL**

Made this \_\_\_\_\_ Day of \_\_\_\_\_, \_\_\_\_\_

\_\_\_\_\_  
(Corporation, Individual, or Partnership)

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

The party above named, as bidder, declares that the only person or persons interested in this bid or proposal as principal or principals is or are named above, and that no person that hereinbefore named as any interest in this proposal or in the contract proposed to be taken; that this bid or proposal is not made with any person or persons making a bid or proposal for the same purpose; and that no officer or employee of the Mount Pleasant Central School District, is or shall be, or will become, directly or indirectly interested as a contracting party, partner, stockholder, surety or otherwise in the performance of the contract, or in the supplies, work, that business to which it relates, or any portion of the profits thereof; that he has examined the site of the work, that he has examined the Contract Documents and the drawings therein referred to and has read the "Information to Bidders" hereto attached; and he proposes and agrees that this Proposal be accepted, that he will contract in the form provided for the **PHYSICAL EDUCATION DEPARTMENT RENOVATIONS AT WESTLAKE HIGH SCHOOL** to furnish all necessary labor, material, plant, power tools, equipment, supplies, and transportation, and perform all work mentioned in the contract documents for the following lump sum base bid price, alternates, and unit prices:

(SEE FOLLOWING PAGES AND FILL IN ALL INFORMATION REQUIRED.)



**SECTION 00 41 16 – BID FORM – (MULTIPLE-PRIME CONTRACT)**

**ELECTRICAL CONSTRUCTION CONTRACTOR – Contract # 4**

To: Mt. Pleasant Central School District  
825 Westlake Drive  
Thornwood, NY 10594

Project: Westlake High School Locker Room Renovation Project

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

Submitted by: \_\_\_\_\_  
(full name  
and address) \_\_\_\_\_  
\_\_\_\_\_

Telephone No. \_\_\_\_\_

**1.1 OFFER**

Having examined the Place of The Work and having familiarized himself with the local conditions and any other conditions affecting the Electrical Construction Work of this Project, including the availability of materials and labor, and fully understanding the requirements of the Bidding and Contract Documents for the above mentioned Project, the Undersigned Contractor hereby offers to furnish all labor, supervision, materials, tools, equipment, transportation, and services necessary to perform and complete the Electrical Construction Work of the Project in strict accordance with the Contract Documents within the time limit, and that if this Bid is accepted, the Undersigned agrees to enter into the Contract with the Owner to perform and complete this Work for the Sum of:

**BASE BID (includes allowances per Section 01 21 00)**

\$ \_\_\_\_\_  
(figures)

\_\_\_\_\_ dollars,  
(written)

in lawful money of the United States of America.

We have included the Security Bid Bond as required by the instruction to Bidders.

The Owner is exempt from paying State and Local sales taxes on any materials which it purchases for this project. In computing their bids, contractors shall not include the sales and compensating use taxes of the State of New York or of any City and County in the State of New York for any supplies or materials to be used by the Contractor for and on behalf of the Owner. It



SECTION 00 41 16 – BID FORM ELECTRICAL CONSTRUCTION CONTRACTOR

shall be the Contractor's responsibility to secure the State of New York Dept. of Taxation ST 120-1, Contractor's Exemption Purchase Certificate and to comply with all instructions of this form.

1.2 UNIT PRICES – None

1.3 ALLOWANCES

The Bidder hereby certifies that the Base Bid includes the following cash allowances as stipulated by the Architect in the Specifications.

**a. Allowance EC-1: Contractor shall include a contingency allowance of \$15,000.00 for use according to the Owner's Instructions.**

1.4 ACCEPTANCE

This offer shall be open to acceptance and is irrevocable for forty-five (45) calendar days from the Bid closing date. Contract Award shall be determined by the Lowest Responsible Base Bid plus any combination of Alternates at the discretion of the Owner.

If this Bid is accepted by the Owner within the time period stated above, we will

- Execute the Agreement within seven (7) days of receipt of Notice to Proceed.
- Furnish the required bonds within seven (7) days of receipt of Notice to Proceed in the form described in Contract Documents.
- Commence Work within seven (7) days after written Notice to Proceed.

If this Bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required bonds, the Bid security shall be forfeited as damages to the Owner by reason of our failure, limited in amount to the lesser of the face value of the Bid security or the difference between this Bid and the Bid upon which a Contract is signed.

In the event our Bid is not accepted within the time stated above, the required security deposit will be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

The sum given in the Base Bid represents the entire cost of the Electrical Construction Work of the Project. The sum given shall include any and all cost for insurance, including all insurance required by the Agreement, any and all fees for licenses and permits. The Undersigned agrees that no claim will be made for any additional costs regardless of any increases in costs such as higher wage scales or material prices. No amount is included in the Base Bid for State and Local sales taxes on any materials which it purchases for this Project.

The Undersigned has carefully checked all the figures used in compiling the sum given in the Base Bid and understands that the Owner will not be responsible for any errors or omissions incurred by the Undersigned in making up of this Bid. The Undersigned further understands that no modification or withdrawal of this proposal will be permitted after the time specified for the receipt of Bids.



SECTION 00 41 16 – BID FORM ELECTRICAL CONSTRUCTION CONTRACTOR

The Undersigned has examined the location of the proposed Electrical Construction Work, Drawings, Specifications and other Contract Documents and is familiar with local conditions at the place where said Work is to be performed, including, without limitation, the Center for Disease Control (CDC) guidelines, NYS Governor’s Executive Order 202.34, NYS Interim Guidance for Construction Activities during the COVID-19 Public Health Emergency and any other federal, state or local requirements and guidelines related to the COVID-19 pandemic. Refer to the General Conditions of the Contract for Construction for additional requirements.

1.5 CONTRACT TIME

If this Bid is accepted, we will

- Substantially Complete the Work as noted in Milestone Schedule 011100. Final Completion shall be within Thirty (30) days from Substantial Completion.

1.6 ADDENDA

The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the bid sum.

Addendum #1 Dated \_\_\_\_\_  
Addendum #2 Dated \_\_\_\_\_  
Addendum #3 Dated \_\_\_\_\_  
Addendum #4 Dated \_\_\_\_\_

1.7 BID FORM SIGNATURES

The Corporate Seal of

\_\_\_\_\_  
(Bidder – print the full name of your firm)  
was hereunto affixed in the presence of:

\_\_\_\_\_  
(Authorized signing officer Title)  
(Seal)

\_\_\_\_\_  
(Authorized signing officer Title)  
(Seal)

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.



SECTION 00 41 16 – BID FORM GENERAL CONSTRUCTION CONTRACTOR

To: Mt. Pleasant Central School District  
825 Westlake Drive  
Thornwood, NY 10594

Project: Westlake High School Locker Room Renovation Project

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

Submitted by: \_\_\_\_\_  
(full name  
and address) \_\_\_\_\_  
\_\_\_\_\_

Telephone No. \_\_\_\_\_

1.1 OFFER

Having examined the Place of The Work and having familiarized himself with the local conditions and any other conditions affecting the General Construction Work of this Project, including the availability of materials and labor, and fully understanding the requirements of the Bidding and Contract Documents for the above mentioned Project, we, the Undersigned Contractor, hereby offer to enter into a Contract to furnish all labor, supervision, materials, equipment, tools, transportation, and services necessary to perform and complete the General Construction Work of the Project in strict accordance with the Contract Documents within the time limit, and that if this Bid is accepted, the Undersigned agrees to enter into the Contract with the Owner to perform and complete this Work for the Sum of:

**BASE BID (includes allowances per Section 01 21 00)**

---

\$ \_\_\_\_\_  
(figures)

\_\_\_\_\_ dollars,  
(written)

---

in lawful money of the United States of America.

We have included the Security Bid Bond as required by the instruction to Bidders.

The Owner is exempt from paying State and Local sales taxes on any materials which it purchases for this project. In computing their bids, contractors shall not include the sales and compensating use taxes of the State of New York or of any City and County in the State of New York for any supplies or materials to be used by the Contractor for and on behalf of the Owner. It shall be the Contractor's responsibility to secure the State of New York Dept. of Taxation ST 120-1, Contractor's Exemption Purchase Certificate and to comply with all instructions of this form.



SECTION 00 41 16 – BID FORM GENERAL CONSTRUCTION CONTRACTOR

1.2 ALTERNATES

Bidders are required to Bid on all alternates within the Bidding Documents. Bidders shall set forth in the space provided, therefore, the amount to be added to or deducted from the Base Bid. If the Bidder does not desire to make a change from the Base Bid, he shall so indicate by using the words "No Change."

1.3 UNIT PRICES

The undersigned agrees, if awarded the contract, to perform work "in addition to," or "delete work from" the scope of the contract documents as directed by the owner and/or architect, computed in accordance with the unit prices herein after listed.

Unit prices shall be the total compensation for the item and include all overhead, profit, and any other charges of the contractor and/or subcontractor in connection therewith.

Adjustments will be computed on net variation of total quantities of like items.

The owner reserves the right to accept or reject any and/or all of the unit prices listed below prior to the execution of the contract.

Item No.	Schedule Item	Measurement	Unit Price
1.	GC-1 - Minor tent enclosure for general abatement. For any additional areas beyond the base bid contract scope	Per enclosure	\$ _____
2.	GC -2 – Minor tent enclosure for pipe abatement (figure 5 fittings ) For any additional areas beyond the base bid contract scope	Measurement Per enclosure	Unit Price \$ _____
3.	GC -2 – Minor tent enclosure for wall probes – Beyond the known asbestos containing walls identified on abatement drawing ASB 1.01	Measurement Per enclosure	Unit Price \$ _____

1.4 ALLOWANCES

The Bidder hereby certifies that the Base Bid includes the following cash allowances as stipulated by the Architect in the Specifications.

- a. **Allowance GC-1: Contractor shall include a contingency allowance of \$30,000.00 for use according to the Owner's Instructions.**
- b. **Allowance GC-2: Asbestos Fittings** - in addition to the base bid abatement work identified on Abatement drawings the Contractor shall include in their base bid an allowance of 10 ea. fittings (Figure individual glove bag removal) for abatement of any additional Asbestos Fittings encountered.

1.5 ACCEPTANCE

Mount Pleasant CSD/Physical  
Education Department Renovations  
at Westlake High School  
NYS ED # 66-08-01-06-0-005-020

00 41 16-2

#4.1449.08



SECTION 00 41 16 – BID FORM GENERAL CONSTRUCTION CONTRACTOR

This offer shall be open to acceptance and is irrevocable for forty-five (45) calendar days from the Bid closing date. Contract Award shall be determined by the Lowest Responsible Base Bid plus any combination of Alternates at the discretion of the Owner.

If this Bid is accepted by the Owner within the time period stated above, we will

- Execute the Agreement within seven (7) days of receipt of Notice to Proceed.
- Furnish the required bonds within seven (7) days of receipt of Notice to Proceed in the form described in Contract Documents.
- Commence Work within seven (7) days after written Notice to Proceed.

If this Bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required bonds, the Bid security shall be forfeited as damages to the Owner by reason of our failure, limited in amount to the lesser of the face value of the Bid security or the difference between this Bid and the Bid upon which a Contract is signed.

In the event our Bid is not accepted within the time stated above, the required security deposit will be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

The sum given in the Base Bid represents the entire cost of the General Construction Work of the Project. The sum given shall include any and all cost for insurance, including all insurance required by the Agreement, any and all fees for licenses and permits. The Undersigned agrees that no claim will be made for any additional costs regardless of any increases in costs such as higher wage scales or material prices. No amount is included in the Base Bid for State and Local sales taxes on any materials which it purchases for this Project.

The Undersigned has carefully checked all the figures used in compiling the sum given in the Base Bid and understands that the Owner will not be responsible for any errors or omissions incurred by the Undersigned in making up of this Bid. The Undersigned further understands that no modification or withdrawal of this proposal will be permitted after the time specified for the receipt of Bids.

The Undersigned has examined the location of the proposed General Construction Work, Drawings, Specifications and other Contract Documents and is familiar with local conditions at the place where said Work is to be performed, including, without limitation, the Center for Disease Control (CDC) guidelines, NYS Governor's Executive Order 202.34, NYS Interim Guidance for Construction Activities during the COVID-19 Public Health Emergency and any other federal, state or local requirements and guidelines related to the COVID-19 pandemic. Refer to the General Conditions of the Contract for Construction for additional requirements.

1.6 CONTRACT TIME

If this Bid is accepted, we will



SECTION 00 41 16 – BID FORM GENERAL CONSTRUCTION CONTRACTOR

- Substantially Complete the Work as noted in Milestone Schedule.011100. Final Completion shall be within Thirty (30) days from Substantial Completion.

1.7 ADDENDA

The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the bid sum.

Addendum #1 Dated \_\_\_\_\_  
Addendum #2 Dated \_\_\_\_\_  
Addendum #3 Dated \_\_\_\_\_  
Addendum #4 Dated \_\_\_\_\_

1.8 BID FORM SIGNATURES

The Corporate Seal of

\_\_\_\_\_  
(Bidder – print the full name of your firm)  
was hereunto affixed in the presence of:

\_\_\_\_\_  
(Authorized signing officer Title)  
(Seal)

\_\_\_\_\_  
(Authorized signing officer Title)  
(Seal)

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.



SECTION 00 41 16 – BID FORM MECHANICAL CONSTRUCTION CONTRACTOR

To: Mt. Pleasant Central School District  
825 Westlake Drive  
Thornwood, NY 10594

Project: Westlake High School Locker Room Renovation Project

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

Submitted by: \_\_\_\_\_  
(full name  
and address) \_\_\_\_\_  
\_\_\_\_\_

Telephone No. \_\_\_\_\_

1.1 OFFER

Having examined the Place of The Work and having familiarized himself with the local conditions and any other conditions affecting the Mechanical Construction Work of this Project, including the availability of materials and labor, and fully understanding the requirements of the Bidding and Contract Documents for the above mentioned Project, we, the Undersigned Contractor, hereby offer to enter into a Contract to furnish all labor, supervision, materials, equipment, tools, transportation, and services necessary to perform and complete the Mechanical Construction Work of the Project in strict accordance with the Contract Documents within the time limit, and that if this Bid is accepted, the Undersigned agrees to enter into the Contract with the Owner to perform and complete this Work for the Sum of:

**BASE BID (includes allowance per Section 01 21 00)**

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

(figures)

\_\_\_\_\_ dollars,

(written)

in lawful money of the United States of America.

We have included the Security Bid Bond as required by the instruction to Bidders.

The Owner is exempt from paying State and Local sales taxes on any materials which it purchases for this project. In computing their bids, contractors shall not include the sales and compensating use taxes of the State of New York or of any City and County in the State of New York for any supplies or materials to be used by the Contractor for and on behalf of the Owner. It shall be the Contractor's responsibility to secure the State of New York Dept. of Taxation ST 120-1, Contractor's Exemption Purchase Certificate and to comply with all instructions of this form.



SECTION 00 41 16 – BID FORM MECHANICAL CONSTRUCTION CONTRACTOR

1.2 UNIT PRICES – None

1.3 ALLOWANCES

The Bidder hereby certifies that the Base Bid includes the following cash allowances as stipulated by the Architect in the Specifications.

**a. Allowance MC-1: Contractor shall include a contingency allowance of \$15,000.00 for use according to the Owner's Instructions.**

1.4 ACCEPTANCE

This offer shall be open to acceptance and is irrevocable for forty-five (45) calendar days from the Bid closing date. Contract Award shall be determined by the Lowest Responsible Base Bid plus any combination of Alternates at the discretion of the Owner.

If this Bid is accepted by the Owner within the time period stated above, we will

- Execute the Agreement within seven (7) days of receipt of Notice to Proceed.
- Furnish the required bonds within seven (7) days of receipt of Notice to Proceed in the form described in Contract Documents.
- Commence Work within seven (7) days after written Notice to Proceed.

If this Bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required bonds, the Bid security shall be forfeited as damages to the Owner by reason of our failure, limited in amount to the lesser of the face value of the Bid security or the difference between this Bid and the Bid upon which a Contract is signed.

In the event our Bid is not accepted within the time stated above, the required security deposit will be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

The sum given in the Base Bid represents the entire cost of the Mechanical Construction Work of the Project. The sum given shall include any and all cost for insurance, including all insurance required by the Agreement, any and all fees for licenses and permits. The Undersigned agrees that no claim will be made for any additional costs regardless of any increases in costs such as higher wage scales or material prices. No amount is included in the Base Bid for State and Local sales taxes on any materials which it purchases for this Project.

The Undersigned has carefully checked all the figures used in compiling the sum given in the Base Bid and understands that the Owner will not be responsible for any errors or omissions incurred by the Undersigned in making up of this Bid. The Undersigned further understands that no modification or withdrawal of this proposal will be permitted after the time specified for the receipt of Bids.



SECTION 00 41 16 – BID FORM MECHANICAL CONSTRUCTION CONTRACTOR

The Undersigned has examined the location of the proposed Mechanical Construction Work, Drawings, Specifications and other Contract Documents and is familiar with local conditions at the place where said Work is to be performed, including, without limitation, the Center for Disease Control (CDC) guidelines, NYS Governor’s Executive Order 202.34, NYS Interim Guidance for Construction Activities during the COVID-19 Public Health Emergency and any other federal, state or local requirements and guidelines related to the COVID-19 pandemic. Refer to the General Conditions of the Contract for Construction for additional requirements.

1.5 CONTRACT TIME

If this Bid is accepted, we will

- Substantially Complete the Work as noted in Milestone Schedule. Final Completion shall be within Thirty (30) days from Substantial Completion.

1.6 ADDENDA

The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the bid sum.

Addendum #1 Dated \_\_\_\_\_  
Addendum #2 Dated \_\_\_\_\_  
Addendum #3 Dated \_\_\_\_\_  
Addendum #4 Dated \_\_\_\_\_

1.7 BID FORM SIGNATURES

The Corporate Seal of

\_\_\_\_\_  
(Bidder – print the full name of your firm)  
was hereunto affixed in the presence of:

\_\_\_\_\_  
(Authorized signing officer Title)  
(Seal)

\_\_\_\_\_  
(Authorized signing officer Title)  
(Seal)

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.



SECTION 00 41 16 – BID FORM PLUMBING CONSTRUCTION CONTRACTOR

To: Mt. Pleasant Central School District  
825 Westlake Drive  
Thornwood, NY 10594

Project: Westlake High School Locker Room Renovation Project

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

Submitted by: \_\_\_\_\_  
(full name  
and address) \_\_\_\_\_  
\_\_\_\_\_

Telephone No. \_\_\_\_\_

1.1 OFFER

Having examined the Place of The Work and having familiarized himself with the local conditions and any other conditions affecting the Plumbing Construction Work of this Project, including the availability of materials and labor, fully understanding the requirements of the Bidding and Contract Documents for the above mentioned Project, we, the Undersigned Contractor, hereby offer to enter into a Contract to furnish all labor, supervision, materials, equipment, tools, transportation, and services necessary to perform and complete the Plumbing Construction Work of the Project in strict accordance with the Contract Documents within the time limit, and that if this Bid is accepted, the Undersigned agrees to enter into the Contract with the Owner to perform and complete this Work for the Sum of:

**BASE BID (includes allowance per Section 01 21 00)**

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

(figures)

\_\_\_\_\_ dollars,

(written)

in lawful money of the United States of America.

We have included the Security Bid Bond as required by the instruction to Bidders.

The Owner is exempt from paying State and Local sales taxes on any materials which it purchases for this project. In computing their bids, contractors shall not include the sales and compensating use taxes of the State of New York or of any City and County in the State of New York for any supplies or materials to be used by the Contractor for and on behalf of the Owner. It shall be the Contractor's responsibility to secure the State of New York Dept. of Taxation ST 120-1, Contractor's Exemption Purchase Certificate and to comply with all instructions of this form.



SECTION 00 41 16 – BID FORM PLUMBING CONSTRUCTION CONTRACTOR

1.2 UNIT PRICES – None

1.3 ALLOWANCES

The Bidder hereby certifies that the Base Bid includes the following cash allowances as stipulated by the Architect in the Specifications.

**a. Allowance PC-1: Contractor shall include a contingency allowance of \$20,000.00 for use according to the Owner's Instructions.**

1.4 ACCEPTANCE

This offer shall be open to acceptance and is irrevocable for forty-five (45) calendar days from the Bid closing date. Contract Award shall be determined by the Lowest Responsible Base Bid plus any combination of Alternates at the discretion of the Owner.

If this Bid is accepted by the Owner within the time period stated above, we will

- Execute the Agreement within seven (7) days of receipt of Notice to Proceed.
- Furnish the required bonds within seven (7) days of receipt of Notice to Proceed in the form described in Contract Documents.
- Commence Work within seven (7) days after written Notice to Proceed.

If this Bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required bonds, the Bid security shall be forfeited as damages to the Owner by reason of our failure, limited in amount to the lesser of the face value of the Bid security or the difference between this Bid and the Bid upon which a Contract is signed.

In the event our Bid is not accepted within the time stated above, the required security deposit will be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

The sum given in the Base Bid represents the entire cost of the Plumbing Construction Work of the Project. The sum given shall include any and all cost for insurance, including all insurance required by the Agreement, any and all fees for licenses and permits. The Undersigned agrees that no claim will be made for any additional costs regardless of any increases in costs such as higher wage scales or material prices. No amount is included in the Base Bid for State and Local sales taxes on any materials which it purchases for this Project.

The Undersigned has carefully checked all the figures used in compiling the sum given in the Base Bid and understands that the Owner will not be responsible for any errors or omissions incurred by the Undersigned in making up of this Bid. The Undersigned further understands that no modification or withdrawal of this proposal will be permitted after the time specified for the receipt of Bids.



SECTION 00 41 16 – BID FORM PLUMBING CONSTRUCTION CONTRACTOR

The Undersigned has examined the location of the proposed Plumbing Construction Work, Drawings, Specifications and other Contract Documents and is familiar with local conditions at the place where said Work is to be performed, including, without limitation, the Center for Disease Control (CDC) guidelines, NYS Governor’s Executive Order 202.34, NYS Interim Guidance for Construction Activities during the COVID-19 Public Health Emergency and any other federal, state or local requirements and guidelines related to the COVID-19 pandemic. Refer to the General Conditions of the Contract for Construction for additional requirements.

1.5 CONTRACT TIME

If this Bid is accepted, we will

- Substantially Complete the Work as noted in Milestone Schedule 011100. Final Completion shall be within Thirty (30) days from Substantial Completion.

1.6 ADDENDA

The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the bid sum.

Addendum #1 Dated \_\_\_\_\_  
Addendum #2 Dated \_\_\_\_\_  
Addendum #3 Dated \_\_\_\_\_  
Addendum #4 Dated \_\_\_\_\_

1.7 BID FORM SIGNATURES

The Corporate Seal of

\_\_\_\_\_  
(Bidder – print the full name of your firm)  
was hereunto affixed in the presence of:

\_\_\_\_\_  
(Authorized signing officer Title)  
(Seal)

\_\_\_\_\_  
(Authorized signing officer Title)  
(Seal)

If the Bid is a joint venture or partnership, add additional forms of execution for each member of the joint venture in the appropriate form or forms as above.



SURETY'S CONSENT

MOUNT PLEASANT CENTRAL SCHOOL DISTRICT

KNOW ALL MEN BY THESE PRESENTS, that \_\_\_\_\_ a Corporation of the State of \_\_\_\_\_ having its principal office at \_\_\_\_\_ and \_\_\_\_\_ a Company/ Corporation in the State of \_\_\_\_\_ having its principal office at \_\_\_\_\_ being (a) surety company (is) qualified to do business in the State of New York in consideration of the premises and of One Dollar to it (them) in hand paid by the Owner, and of other good and valuable considerations, the receipt thereof is hereby acknowledged, do (as) consent and agree, that if the contract for which the preceding bid or proposal is made be awarded to the person or persons making the security, for the full and faithful performance of said work, and, for the protection of all persons performing or furnishing labor or materials for the performance of said contract in the form required; the performance bond and the labor and material obligations to be in an amount equal to 100% of the contract price, and to be conditioned so as to indemnify the Owner against loss due to the failure of the Contractor to meet the stipulations of said bond; and if the said person or persons shall omit or refuse to execute such contract and give the proper security within ten (10) days after written notice that same is ready for execution, if so awarded, and if sum, which the Owner may be obliged to pay to the person or persons by whom the contract shall be finally executed, exceeds the sum to which the person or persons making this bid or proposal would be entitled, then, the said surety company or companies will pay, without proof of notice or demand, to the Owner the amount of any such excess; the sums in each case to be calculated upon the estimated quantities of work, labor and materials by which the bids are tested.

\_\_\_\_\_  
Surety

\_\_\_\_\_  
Contractor

\_\_\_\_\_  
Surety

\_\_\_\_\_  
As To Surety

\_\_\_\_\_  
By Attorney



CERTIFICATE OF BIDDER

MOUNT PLEASANT CENTRAL SCHOOL DISTRICT

Pursuant to the laws of the State of New York, the undersigned does herewith certify to the Owner that it owns, leases or controls all of the necessary equipment required to perform the work shown and described on the plans, specifications, and contract drawings for the **PHYSICAL EDUCATION DEPARTMENT RENOVATIONS AT WESTLAKE HIGH SCHOOL.**

The undersigned does further certify to the Owner that it is financially responsible and financially capable of accomplishing the work to be performed under the said contract above mentioned.

The undersigned does further certify to the Owner that it is fully qualified to perform the work under the said contract above mentioned.

IN WITNESS WHEREOF, the undersigned has caused this Certificate to be executed this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
President

Sworn and subscribed to  
before me this \_\_\_\_\_ day  
of \_\_\_\_\_, \_\_\_\_\_.

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



## QUALIFICATIONS OF BIDDERS

**Experience and Qualifications of the Bidder:** Each bidder is required to submit the following documentation to demonstrate its experience and qualifications for the work of the Project for which a bid is submitted:

- a. A description of its experience with projects of comparative size, complexity, and cost, together with documentary evidence showing that said projects were completed to the Owner's satisfaction and were completed in a timely fashion;
- b. Documentation from each of the projects it has performed capital work in the last five (5) years concerning the bidder's:
  - (i) timeliness of performance of the work of the project
  - (ii) evidence that the project was completed to the Owner's satisfaction;
  - (iii) whether or not any extensions of time were requested by the contractor and whether or not such requests were granted;
  - (iv) whether litigation and/or arbitration was commenced by either the Owner or the bidder as a result of the work of the project performed by the bidder;
  - (v) whether any liens were filed on the project by subcontractors or material suppliers of the bidder;
  - (vi) whether the bidder was defaulted on the project by the owner;
  - (vii) whether the bidder made any claims for extra work on the project, including whether said claim resulted in a change order;
- c. Documentation evidencing the bidder's financial responsibility, including a certified financial statement prepared by a certified public accountant.
- d. Documentation evidencing the bidder's existence under the same name for the last five (5) years.
- e. Documentation evidencing the bidder's Worker's Compensation Experience Modification.



**STATEMENT OF BIDDER'S QUALIFICATIONS**

**IMPORTANT: BIDDERS ARE REQUIRED TO FURNISH A COMPLETE ANSWER TO ALL OF THE QUESTIONS IN THIS STATEMENT. IN THE EVENT A COMPLETE ANSWER IS NOT PROVIDED, THE BID WILL BE REJECTED.**

1. Name of Bidder

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2. Type of Business Entity

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3. If the bidder is a corporation, state the date and place of incorporation of the corporation.

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4. For how many years has the bidder done business under its present name?

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5. List the persons who are directors, officers, owners, managerial employees or partners in the bidder's business.

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6a. Have any of the persons listed in Number 5 owned/operated/been shareholders in any other companies? If so, please state name of owned/operated/been shareholders and names of other companies:

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6b. If the answer to number 6a is in the affirmative, list said persons and the names of their previous affiliations.

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7. Has any director, officer, owner or managerial employee had any professional license suspended or revoked? If the answer to this question is yes, list the name of the individual, the professional license he/she formerly held, whether said license was revoked or suspended and the date of the revocation or suspension.

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8. Has the bidder been found guilty of any OSHA Violations? If the answer to this question is yes, describe the nature of the OSHA violation, an explanation of remediation or other steps taken regarding such violation(s).

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9. Has the bidder been charged with any claims pertaining to unlawful intimidation or discrimination against any employee by reason of race, creed, color, disability, sex or natural origin and/or violations of an employee's civil rights or equal employment opportunities? If the answer to this question is yes, list the persons making such claim against the bidder, a description of the claim, the status of the claim, and what disposition (if any) has been made regarding such claim.

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10. Has the bidder been named as a party in any lawsuit arising from performance of work related to any project in which it has been engaged? If the answer to this question is yes, list all such lawsuits, the index number associated with said suit and the status of the lawsuit at the time of the submission of this bid.

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11. Has the bidder been the subject of an investigation and/or proceedings before the Department of Labor for alleged violations of the Labor Law as it relates to the payment of prevailing wages and/or supplemental payment requirements? If the answer to this question is yes, please list each such instance of the commencement of a Department of Labor proceeding, for which project such proceeding was commenced, and the status of the proceeding at the time of the submission of this bid.

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12. Has the bidder been the subject of an investigation and/or proceeding before any law enforcement agency, including, but not limited to any District Attorney's Office? If the answer to this question is yes, please list each such instance, the law enforcement agency, the nature of the proceeding, the project for which such proceeding was commenced, if applicable to a project, and the status of the proceeding at the time of the submission of this bid.

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13. Has the bidder been the subject of proceedings involving allegations that it violated the Workers' Compensation Law including but not limited to the failure to provide proof of worker's compensation or disability coverage and/or any lapses thereof. If the answer to this question is yes, list each such instance of violation and the status of the claimed violation at the time of the submissions of this bid.

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14. Has the bidder, its officers, directors, owner and/or managerial employees been convicted of a crime or been the subject of a criminal indictment? If the answer to this question is yes, list the name of the individual convicted or indicted, the charge against the individual and the date of disposition of the charge.

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15. Has the bidder been charged with and/or found guilty of any violations of federal, state, or municipal environmental and/or health laws, codes, rules and/or regulations? If the answer to this question is yes, list the nature of the charge against the bidder, the date of the charge, and the status of the charge at the time of the submission of this bid.

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16. Has the bidder bid on any projects for the period September 1, 2012 to present? If the answer to this question is yes, list the projects bid on, whether said bid was awarded to the bidder and the expected date of commencement of the work for said project. For those projects listed, if the bidder was not awarded the contract, state whether the bidder was the lowest monetary bidder.

**IMPORTANT: BIDDERS ARE REQUIRED TO FURNISH A COMPLETE LIST OF PROJECTS AS REQUIRED BY THIS QUESTION #16 WITH ITS BID. IN THE EVENT THE LIST REQUESTED IS NOT SUBMITTED WITH THE BIDDER'S BID, THE BID WILL BE REJECTED.**

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17. Does the bidder have any projects ongoing at the time of the submission of this bid? If the answer to this question is yes, list the projects on which the bidder is currently working, the percentage complete, and the expected date of completion of said project.

**IMPORTANT: BIDDERS ARE REQUIRED TO FURNISH A COMPLETE LIST OF PROJECTS AS REQUIRED BY THIS QUESTION #17 WITH ITS BID. IN THE EVENT THE LIST REQUESTED IS NOT SUBMITTED WITH THE BIDDER'S BID, THE BID WILL BE REJECTED.**

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18. Has the bidder ever been terminated from a Project by the Owner? If the answer to this question is yes, list the projects on which the bidder was terminated, the nature of the termination (convenience, suspension, for cause), and the date of said termination.

**IMPORTANT: BIDDERS ARE REQUIRED TO FURNISH A COMPLETE LIST OF PROJECTS AS REQUIRED BY THIS QUESTION #18 WITH ITS BID. IN THE EVENT THE LIST REQUESTED IS NOT SUBMITTED WITH THE BIDDER'S BID, THE BID WILL BE REJECTED.**

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19. Has the bidder's surety ever been contacted to provide supervisory services in connection with an on-going project. If the answer to this question is yes, list the project(s) for which the surety provided supervisory services.

**IMPORTANT: BIDDERS ARE REQUIRED TO FURNISH A COMPLETE LIST OF PROJECTS AS REQUIRED BY THIS QUESTION #19 WITH ITS BID. IN THE EVENT THE LIST REQUESTED IS NOT SUBMITTED WITH THE BIDDER'S BID, THE BID WILL BE REJECTED.**

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Dated:

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

(Signature)

\_\_\_\_\_  
(Print Name and Title)

Sworn to before me this  
\_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

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







CONFLICT OF INTEREST CERTIFICATE

Pursuant to Section 2:4-15 of the Administrative Code of the State of New York, the undersigned does herewith certify that no officer or employee is interested in this contract, nor shall he participate in any profits with the undersigned or any other person, or receive any compensation, commission, gift, or other reward for his services, except the salary or fees established by law or by ordinance or resolution of the council.

IN WITNESS WHEREOF, the undersigned has caused this certificate to be executed this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

Sworn and subscribed to before me this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
President  
(Or Authorized Agent of Corporation)

\_\_\_\_\_  
Secretary



FORM OF DISCLOSURE

**THE UNDERSIGNED AFFIRMS THAT THE FOLLOWING CONSTITUTE ALL OFFICERS, DIRECTORS, PARTNERS, OR CONTROLLING PRINCIPALS OF THE FIRM:**

<u>Name</u>	<u>Title</u>
_____	_____
_____	_____

1. Does any School District Board Member, administrator, or employee possess any financial interest, directly or indirectly, in the firm? \_\_\_\_\_ If yes, set forth the basis upon which a financial interest exists in the firm:

\_\_\_\_\_  
\_\_\_\_\_

2. Has the firm or any of its officers, directors, partners, or controlling principals possessed any interest in transactions heretofore entered into with the School District? \_\_\_\_\_ If yes, please describe transaction(s):

\_\_\_\_\_  
\_\_\_\_\_

3. Does any direct relative of a member of the Board, administrators, or staff possess any financial interest, directly or indirectly, in the firm (for purpose of this inquiry a direct relative is to be defined as a parent, spouse, child or sibling)? \_\_\_\_\_ If yes, set forth below the School District Board Member, administrator, or staff member whose relation possess an interest and the relationship:

\_\_\_\_\_  
\_\_\_\_\_

THE UNDERSIGNED AFFIRMS THAT THE ABOVE STATEMENTS ARE TRUE AND UNDERSTANDS THAT ANY FALSE STATEMENT SHALL CONSTITUTE A VIOLATION OF THE PENAL CODE OR GENERAL MUNICIPAL LAW AS APPLICABLE.

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

Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

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

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



**NON-COLLUSIVE FORM**  
**BID PROPOSAL CERTIFICATIONS**

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

Business Address \_\_\_\_\_

Telephone Number \_\_\_\_\_ Date of Bid \_\_\_\_\_

**I. General Bid Certification**

The bidder certifies that he will furnish, at the prices quoted, the materials, equipment and/or services as proposed on this Bid.

**II. Non-Collusive Bidding Certification**

The following statement is made pursuant to Section 103-D of the General Municipal Law, as amended by Chapter 675 of the Laws of 1966, and Section 139-D of the State Finance Law, as amended by Chapter 675 of the Laws of 1966, and Section 2604 of the Public Authorities Law, as amended by Chapter 675 of the Laws of 1966.

By submission of this bid proposal, the bidder certifies that he/she is complying with Section 103-d of the General Municipal Law as follows:

Statement of non-collusion in bids and proposals to political subdivision of the state. Every bid or proposal hereafter made to a political subdivision of the state or any public department, agency or official thereof where competitive bidding is required by statute, rule, regulation, or local law, for work or services performed or to be performed or goods sold or to be sold, shall contain the following statement subscribed by the bidder and affirmed by such bidder as true under the penalties of perjury:

Non-collusive bidding certification.

A(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 its knowledge and belief:

I. 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 and will not knowingly be 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 (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 reasons therefor. Where (a) (1) (2) and (3) above have not been complied with, the bid shall not be considered for award nor shall any award be made unless the head of the purchasing unit of the political subdivision, public department agency or official thereof to which the bid is made or his designee, determines that such disclosure was not made for the purpose of restricting competition.

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 one (a).

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 certifications referred to in subdivision II 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 corporation.

**The bidder affirms the above statement as true under the penalties of perjury.**

Signature of Bidder: \_\_\_\_\_  
(Signature of bidder or authorized representative of a corporation)

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

Sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_



**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 School District receive information that a Bidder/Contractor is in violation of the above-referenced certification, the School 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 School 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 School 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 \_\_\_\_\_

201\_\_\_\_

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



DECLARATION OF BIDDER'S INABILITY TO PROVIDE CERTIFICATION OF COMPLIANCE  
WITH THE IRAN DIVESTMENT ACT

*Bidders shall complete this form if they cannot certify that the bidder /contractor or any proposed subcontractor is not identified on the Prohibited Entities List. The District reserves the right to undertake any investigation into the information provided herein or to request additional information from the bidder.*

Name of the Bidder: \_\_\_\_\_

Address of Bidder: \_\_\_\_\_

Has bidder been involved in investment activities in Iran? \_\_\_\_\_  
Describe the type of activities including but not limited to the amounts and the nature of the investments (e.g. banking, energy, real estate) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

If so, when did the first investment activity occur? \_\_\_\_\_

Have the investment activities ended? \_\_\_\_\_

If so, what was the date of the last investment activity? \_\_\_\_\_

If not, have the investment activities increased or expanded since April 12, 2012? \_\_\_\_\_

Has the bidder adopted, publicized, or implemented a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran? \_\_\_\_\_

If so, provide the date of the adoption of the plan by the bidder and proof of the adopted resolution, if any and a copy of the formal plan. \_\_\_\_\_

In detail, state the reasons why the bidder cannot provide the Certification of Compliance with the Iran Divestment Act below (additional pages may be attached):  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

I, \_\_\_\_\_ being duly sworn, deposes and says that he/she is the \_\_\_\_\_ of  
the \_\_\_\_\_ Corporation and the foregoing is true and accurate.

\_\_\_\_\_  
SIGNED

SWORN to before me this

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

201\_\_

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



SECTION 00 45 03 – INSURANCE CERTIFICATION FORM

Project No.: 66-08-01-06-0-005-020

Name of Project: Mount Pleasant CSD Westlake High School Physical Education Department Renovations

Your insurance representative must complete the form below in order to be considered for the award of this bid or project, and it is important that you complete the Bidder's Acknowledgement section of this form. Please note that this Insurance Certification form must accompany your bid submission in order for your bid to be considered.

Each bid will include a copy of the Insurance Certification Form located in the specification in their bid packet. Failure to provide may result in the Owner finding the bidder "non-responsive" to the bid documents.

**Insurance Representative's Acknowledgement:**

We have reviewed the insurance requirements set forth in the Article 10 of the General Conditions for Construction located in the specifications and are capable of providing such insurance to our insured in accordance with such requirements in the event the contract is awarded to our insured and provided our insured pays the appropriate premium.

Insurance Representative:

\_\_\_\_\_

Address:

\_\_\_\_\_

\_\_\_\_\_

Are you an agent for the companies providing the coverage? Yes \_\_\_ No \_\_\_

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

\_\_\_\_\_  
Insurance Representative Signature

**Bidder's Acknowledgement:**

I acknowledge that I have received the insurance requirements of this bid and have considered the costs, if any, of procuring the required insurance and will be able to supply the insurance required in accordance with the bid, if it is awarded. I understand that this Insurance Certification form must be submitted with my bid and my inability to provide the required insurances may result in the rejection of my bid, and the Mount Pleasant Central School District may award the contract to the next lowest/responsive bidder.

Firm name:

\_\_\_\_\_

Address:

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_  
Bidder's Signature



**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 BOARD OF EDUCATION. 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 BOARD OF EDUCATION, its officers and employees 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 and/or Architect/Engineer, in any such litigation, the Contractor shall at his own expense satisfy and discharge the same.

By: \_\_\_\_\_  
(Signature of Authorized Representative of Corporation)

\_\_\_\_\_  
(Print Name and Title)

\_\_\_\_\_  
(Date)



SECTION 004643 – WAGE AND HOUR RATES

1.01 GENERAL

- A. The following minimum wage rates, health and welfare and pension fund contributions are determined by the Industrial Commissioner of the State of New York in accordance with the provisions of Section 220 of the Labor Law.
- B. All contractors will be bound and obligated by the Laws of New York State to ensure payment to all workers involved with the construction of the project.

1.02 MINIMUM WAGE RATES

- A. The current wage and benefit rates are as set forth in the attached wage schedules.





Andrew M. Cuomo, Governor

Roberta Reardon, Commissioner

Mount Pleasant Central School  
Veronica Moreno, LAN Associates  
252 Main Street  
2nd Floor  
Goshen NY 10924

Schedule Year 2020  
Date Requested 07/30/2020  
PRC# 2020007970

Location Westlake High School  
Project ID# 4.1449.08  
Project Type Physical Education Department Renovations at Westlake High School.

### 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 Wage Case Number (PRC#) has been assigned to the schedule(s) for your project.

The schedule is effective from July 2020 through June 2021. 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](http://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.

There are very few exceptions to this rule. Complete information regarding these exceptions is available on the ["Request for a dispensation to work overtime" form \(PW30\)](#) and ["4 Day / 10 Hour Work Schedule" form \(PW 30.1\)](#).

## 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 12240; Fax to Bureau of Public Work (518) 485-1870; or electronically at the NYSDOL website [www.labor.ny.gov](http://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](http://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](http://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, contemporaneous, 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 12240 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 220-e(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.



Andrew M. Cuomo, Governor

Roberta Reardon, Commissioner

Mount Pleasant Central School  
Veronica Moreno, LAN Associates  
252 Main Street  
2nd Floor  
Goshen NY 10924

Schedule Year 2020  
Date Requested 07/30/2020  
PRC# 2020007970

Location Westlake High School  
Project ID# 4.1449.08  
Project Type Physical Education Department Renovations at Westlake High School.

### 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.

### Contractor Information

All information must be supplied

Federal Employer Identification Number: _____		
Name: _____		
Address: _____ _____		
City: _____	State: _____	Zip: _____
Amount of Contract: \$ _____	Contract Type:	
Approximate Starting Date: ____/____/____	<input type="checkbox"/> (01) General Construction	
Approximate Completion Date: ____/____/____	<input type="checkbox"/> (02) Heating/Ventilation	
	<input type="checkbox"/> (03) Electrical	
	<input type="checkbox"/> (04) Plumbing	
	<input type="checkbox"/> (05) Other : _____	

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



## **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, [www.labor.ny.gov](http://www.labor.ny.gov). <https://labor.ny.gov/formsdocs/ui/IA999.pdf>

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: [dol.misclassified@labor.ny.gov](mailto:dol.misclassified@labor.ny.gov) .

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

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 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](http://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 not fit on the pay stub, an accompanying sheet or attachment of the information will suffice.

**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*

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#### **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 12240

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 [dol.misclassified@labor.ny.gov](mailto:dol.misclassified@labor.ny.gov). All complaints of fraud and violations are taken seriously. You can remain anonymous.**

**Employer Name:**

IA 999 (09/16)



# 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.

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:**  
[www.labor.ny.gov](http://www.labor.ny.gov)

If you feel that you have not received proper wages or benefits, please call our nearest office.\*

Albany	(518) 457-2744	Patchogue	(631) 687-4882
Binghamton	(607) 721-8005	Rochester	(585) 258-4505
Buffalo	(716) 847-7159	Syracuse	(315) 428-4056
Garden City	(516) 228-3915	Utica	(315) 793-2314
New York City	(212) 932-2419	White Plains	(914) 997-9507
Newburgh	(845) 568-5156		

\* For New York City government agency construction projects, please contact the Office of the NYC Comptroller at (212) 669-4443, or [www.comptroller.nyc.gov](http://www.comptroller.nyc.gov) – 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 or 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 requirements on projects, and may issue stop-bid 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 county-by-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 than 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](http://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 12240

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

**Westchester County General Construction**

**Boilermaker** **07/01/2020**

**JOB DESCRIPTION** Boilermaker

**DISTRICT** 4

**ENTIRE COUNTIES**

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

**WAGES**

Per Hour:	07/01/2020	01/01/2021
Boilermaker	\$ 61.24	\$63.38
Repairs & Renovations	61.24	63.38

**SUPPLEMENTAL BENEFITS**

Per Hour:	07/01/2020	01/01/2021
Boilermaker	32% of hourly	32% of hourly
Repair \$ Renovations	Wage Paid + \$ 25.35	Wage Paid + TBA

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 (D, O) on OVERTIME PAGE  
 Repairs & Renovation see (B,E,Q)

**HOLIDAY**

Paid: See (8, 16, 23, 24) on HOLIDAY PAGE  
 Overtime: See (5, 6, 8, 11, 12, 15, 16, 22, 23, 24, 25) on HOLIDAY PAGE  
 NOTE: \*Employee must work in pay week to receive Holiday Pay.  
 \*\*Employee gets 4 times the hourly wage rate for working Labor Day.

**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:

	07/01/2020	01/01/2021
Apprentice(s)	32% of Hourly Wage Paid Plus Amount Below	32% of Hourly Wage Paid Plus Amount Below
1st Term	\$ 19.38	\$ TBA
2nd Term	20.24	TBA
3rd Term	21.08	TBA
4th Term	21.94	TBA
5th Term	22.79	TBA
6th Term	23.65	TBA
7th Term	24.48	TBA

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

4-5

**Carpenter** **07/01/2020**

**JOB DESCRIPTION** Carpenter

**DISTRICT** 8

**ENTIRE COUNTIES**

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

**WAGES**

Per hour: 07/01/2020

Piledriver	\$ 55.93
Dockbuilder	\$ 55.93

**SUPPLEMENTAL BENEFITS**

Per hour:

Journeyworker \$ 52.44

**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
\$22.37	\$27.97	\$36.35	\$44.74

Supplemental benefits per hour:

All Terms: \$ 34.34

8-1556 Db

**Carpenter**

**07/01/2020**

**JOB DESCRIPTION** Carpenter

**DISTRICT 8**

**ENTIRE COUNTIES**

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

**WAGES**

Per hour: 07/01/2020

Carpet/Resilient

Floor Coverer \$ 54.00

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

**SUPPLEMENTAL BENEFITS**

Per hour:

\$ 46.99

**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
\$24.20	\$27.20	\$31.45	\$39.33

Supplemental benefits per hour:

1st	2nd	3rd	4th
\$16.06	\$17.56	\$21.16	\$23.16

8-2287

**Carpenter**

**07/01/2020**

**JOB DESCRIPTION** Carpenter

**DISTRICT 8**

**ENTIRE COUNTIES**

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

**WAGES**

Per Hour: 07/01/2020

Marine Construction:

Marine Diver \$ 70.80  
Marine Tender 50.34

**SUPPLEMENTAL BENEFITS**

Per Hour:

Journeyworker \$ 52.34

**OVERTIME PAY**

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

**HOLIDAY**

Paid: See (18, 19) on HOLIDAY PAGE  
Overtime: See (5, 6, 10, 11, 13, 16, 18, 19) on HOLIDAY PAGE

**REGISTERED APPRENTICES**

Wages per hour:  
One (1) year terms.

1st year \$ 22.37  
2nd year 27.97  
3rd year 36.35  
4th year 44.74

Supplemental Benefits  
Per Hour:

All terms \$ 34.34

8-1456MC

**Carpenter**

**07/01/2020**

**JOB DESCRIPTION** Carpenter

**DISTRICT 8**

**ENTIRE COUNTIES**

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

**WAGES**

Per hour: 07/01/2020

Building  
Millwright \$ 55.70

**SUPPLEMENTAL BENEFITS**

Per hour:

Millwright \$ 54.16

**OVERTIME PAY**

See (B, E, Q) on OVERTIME PAGE

**HOLIDAY**

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

Overtime 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.
\$29.99	\$35.44	\$40.89	\$51.79

Supplemental benefits per hour:  
One (1) year terms:

1st.	2nd.	3rd.	4th.
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\$34.79      \$38.49      \$42.84      \$49.60

8-740.1

**Carpenter**

**07/01/2020**

**JOB DESCRIPTION** Carpenter

**DISTRICT 8**

**ENTIRE COUNTIES**

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

**WAGES**

Per Hour:

07/01/2020

Timberman

\$ 51.05

**SUPPLEMENTAL BENEFITS**

Per Hour:

07/01/2020

\$ 51.79

**OVERTIME PAY**

See (B, E, E2, Q) 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:

One ( 1 ) year terms:

1st	2nd	3rd	4th
\$20.42	\$25.53	\$33.18	\$40.84

Supplemental benefits per hour:

All terms \$ 34.07

8-1556 Tm

**Carpenter**

**07/01/2020**

**JOB DESCRIPTION** Carpenter

**DISTRICT 8**

**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:

07/01/2020

10/18/2020

Core Drilling:

Driller \$ 41.19

Additional

\$ 2.00

Driller Helper

32.62

Note: Hazardous Waste Pay Differential:

For Level C, an additional 10% above wage rate per hour

For Level B, an additional 10% above wage rate per hour

For Level A, an additional 10% above wage rate per hour

Note: When required to work on water: an additional \$ 0.50 per hour.

**SUPPLEMENTAL BENEFITS**

Per hour:

07/01/2020

Driller and Helper

\$ 27.95

**OVERTIME PAY**

OVERTIME: See (B,E,K\*,P,R\*\*) on OVERTIME PAGE.

**HOLIDAY**

Paid: See (5,6) on HOLIDAY PAGE.  
 Overtime: \* See (5,6) on HOLIDAY PAGE.  
 \*\* See (8,10,11,13) on HOLIDAY PAGE.

8-1536-CoreDriller

**Carpenter - Building / Heavy&Highway** **07/01/2020**

**JOB DESCRIPTION** Carpenter - Building / Heavy&Highway **DISTRICT 11**

**ENTIRE COUNTIES**  
 Putnam, Rockland, Westchester

**WAGES**

WAGES:(per hour)		07/01/2020	07/01/2021
BUILDING/HEAVY & HIGHWAY/TUNNEL:			Additional
Carpenter	\$ 45.30		\$ 0.40

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.

NOTE:Carpenters employed in the removal or abatement of asbestos or any toxic or hazardous material or required to work near asbestos or any toxic or hazardous material and required to wear protective equipment shall receive two (2) hours extra pay per day, plus applicable supplemental benefits.

**SUPPLEMENTAL BENEFITS**

Per hour:

Journeyworker \$ 31.53

**OVERTIME PAY**

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

HEAVY&HIGHWAY/TUNNEL:  
 See ( B, E, P, \*R, \*\*T, X ) on OVERTIME PAGE.

\*R applies to Heavy&Highway/Tunnel Overtime Holiday Code 25 with benefits at straight time rate.  
 \*\*T applies to Heavy&Highway/Tunnel Overtime Holiday Codes 5 & 6 with benefits at straight time rate.

**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 including benefits.  
 Overtime: See ( 5, 6, 25 ) on HOLIDAY PAGE.

**REGISTERED APPRENTICES**

1 year terms at the following wage rates:

Indentured after July 1 2016				
1st	2nd	3rd	4th	5th
\$ 22.40	\$ 26.16	\$ 28.05	\$ 29.93	\$ 33.70

Indentured before July 1 2016			
1st	2nd	3rd	4th
\$ 22.40	\$ 26.16	\$ 29.93	\$ 33.70

SUPPLEMENTAL BENEFITS per hour:

All terms \$ 16.28

11-279.1B/HH

**Electrician** **07/01/2020**

**JOB DESCRIPTION** Electrician **DISTRICT 9**

**ENTIRE COUNTIES**

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

**WAGES**

Per hour:	07/01/2020	03/10/2021
Service Technician	\$ 33.90	\$34.40

Service and Maintenance on Alarm and Security Systems.

Maintenance, repair and /or replacement of defective (or damaged) equipment on, but not limited to, Burglar - Fire - Security - CCTV - Card Access - Life Safety Systems and associated devices. (Whether by service contract of T&M by customer request.)

**SUPPLEMENTAL BENEFITS**

Per hour:		
Journeyworker:	\$ 18.43	\$ 19.32

**OVERTIME PAY**

See (B, E, Q) on OVERTIME PAGE

**HOLIDAY**

Paid: See (5, 6, 11, 15, 16, 17, 25, 26) on HOLIDAY PAGE  
 Overtime: See (5, 6, 11, 15, 16, 17, 25, 26) on HOLIDAY PAGE

9-3H

**Electrician**

**07/01/2020**

**JOB DESCRIPTION** Electrician

**DISTRICT 8**

**ENTIRE COUNTIES**

Westchester

**WAGES**

Per hour:	07/01/2020
Electrician/A-Technician	\$ 52.75
Teledata	\$ 52.75

Note: On a job where employees are required to work on bridges over navigable waters, transmission towers, light poles, bosun chairs, swinging scaffolds , etc. 40 feet or more above the water or ground or under compressed air, or tunnel projects under construction or where assisted breathing apparatus is required, they will be paid at the rate of time and one-half for such work except on normal pole line or building construction work.

**SUPPLEMENTAL BENEFITS**

Per hour:	07/01/2020
Journeyworker	\$ 51.80

**OVERTIME PAY**

See (A, G, \*J, P) on OVERTIME PAGE

\*NOTE: Emergency work on Sunday and Holidays is at the time and one-half overtime rate.

**HOLIDAY**

Paid: See (1) on HOLIDAY PAGE  
 Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

**REGISTERED APPRENTICES**

(1) year terms at the following wage rates:

	07/01/2020
1st term	\$ 13.00
2nd term	15.00
3rd term	17.00
4th term	19.00
MIJ 1-12 months	23.00
MIJ 13-18 months	26.50

Supplemental Benefits per hour:

	07/01/2020
1st term	\$ 9.49
2nd term	12.39
3rd term	13.72
4th term	15.05

MIJ 1-12 months	12.08
MIJ 13-18 months	13.38

8-3/W

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**Electrician** **07/01/2020**

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**JOB DESCRIPTION** Electrician

**DISTRICT 8**

**ENTIRE COUNTIES**  
 Westchester

**WAGES**

07/01/2020

Electrician	\$ 26.50
H - Telephone	\$ 26.50

Electrical and Teledata work of limited scope, consisting of repairs and /or replacement of defective electrical and teledata equipment.  
 - Includes all work necessary to retrofit, service, maintain and repair all kinds of lighting fixtures and local lighting controls and washing and cleaning of foregoing fixtures.  
 See Electrician/A Technician classification for all new installations of wiring, conduit, junction boxes and light fixtures.

**SUPPLEMENTAL BENEFITS**

07/01/2020

Electrician & H - Telephone	\$ 13.38
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**OVERTIME PAY**

See (B, G, \*J, P) on OVERTIME PAGE

\*Note: Emergency work on Sunday and Holidays is at the time and one-half overtime rate.

**HOLIDAY**

Paid: See (1) on HOLIDAY PAGE  
 Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

8-3m

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**Elevator Constructor** **07/01/2020**

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**JOB DESCRIPTION** Elevator Constructor

**DISTRICT 4**

**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.

**WAGES**

Per hour:	07/01/2019	03/17/2021
Elevator Constructor	\$ 69.56	\$ 72.29
Modernization & Service/Repair	\$ 54.56	\$ 56.77

**SUPPLEMENTAL BENEFITS**

Per Hour:		
Elevator Constructor	\$ 41.92	\$ 42.92
Modernization & Service/Repairs	\$ 40.86	\$ 41.82

**OVERTIME PAY**

Constructor See ( D, M, T ) on OVERTIME PAGE.

Modern/Service See ( B, F, S ) on OVERTIME PAGE.

**HOLIDAY**

Paid: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE  
 Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

**REGISTERED APPRENTICES**

WAGES PER HOUR:

\*Note: 1st Term is based on Average wage of Constructor & Modernization.  
 Terms 2 thru 4 Based on Journeymans wage of classification Working in.

**1 YEAR TERMS:**

1st Term*	2nd Term	3rd Term	4th Term
50%	55%	65%	75%

**SUPPLEMENTAL BENEFITS**

**Elevator Constructor**

1st Term	\$ 33.38	\$ 34.05
2nd Term	34.20	34.91
3rd Term	35.55	36.30
4th Term	36.89	37.70

**Modernization & Service/Repair**

1st Term	\$ 33.33	\$ 34.00
2nd Term	33.82	34.50
3rd Term	35.09	35.83
4th Term	36.36	37.15

4-1

**Elevator Constructor**

**07/01/2020**

**JOB DESCRIPTION** Elevator Constructor

**DISTRICT 1**

**ENTIRE COUNTIES**

Columbia, Dutchess, Greene, Orange, Putnam, Sullivan, Ulster

**PARTIAL COUNTIES**

Delaware: Towns of Andes, Bovina, Colchester, Davenport, Delhi, Harpersfield, Hemdon, Kortright, Meredith, Middletown, Roxbury, Hancock & Stamford

Rockland: Only the Township of Stony Point.

Westchester: Only the Townships of Bedford, Lewisboro, Cortland, Mt. Kisco, North Salem, Pound Ridge, Somers and Yorktown.

**WAGES**

Per Hour	07/01/2020	01/01/2021
Mechanic	\$ 60.49	\$62.51
Helper	70% of Mechanic Wage Rate	70% of Mechanic Wage Rate

Four (4), ten (10) hour days may be worked for New Construction and Modernization Work at straight time during a week, Monday thru Thursday or Tuesday thru Friday.

\*\*\*Four (4), ten (10) hour days are not permitted for Contract Work/Repair Work

NOTE - In order to use the '4 Day/10 Hour Work Schedule' as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule', form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

**SUPPLEMENTAL BENEFITS**

Per hour	07/01/2020	01/01/2021
Journeyman/Helper	\$ 34.765*	\$ 34.825*

(\*)Plus 6% of regular hourly if less than 5 years of service. Plus 8% of regular hourly rate if more than 5 years of service.

**OVERTIME PAY**

See (D, O) on OVERTIME PAGE

**HOLIDAY**

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

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

Note: When a paid holiday falls on Saturday, it shall be observed on Friday. When a paid holiday falls on Sunday, it shall be observed on Monday.

**REGISTERED APPRENTICES**

Wages per hour:

0-6 mo*	6-12 mo	2nd yr	3rd yr	4th yr
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50 %      55 %      65 %      70 %      80 %

(\*)Plus 6% of the hourly rate, no additional supplemental benefits.

Supplemental Benefits per hour worked:

Same as Journeyperson/Helper

1-138

**Glazier** **07/01/2020**

**JOB DESCRIPTION** Glazier

**DISTRICT 8**

**ENTIRE COUNTIES**

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

**WAGES**

Per hour:	7/01/2020	5/31/2021
		Additional
Glazier	\$ 57.55	\$ 2.00
*Scaffolding	58.55	
Glass Tinting & Window Film	29.17	
**Repair & Maintenance	29.17	

\*Scaffolding includes swing scaffold, mechanical equipment, scissor jacks, man lifts, booms & buckets 24' or more, but not pipe scaffolding.

\*\*Repair & Maintenance- All repair & maintenance work on a particular building, whenever performed, where the total cumulative contract value is under \$148,837. All Glass tinting, window film, regardless of material or intended use, and all affixing of decals to windows or glass.

**SUPPLEMENTAL BENEFITS**

Per hour:	7/01/2020
Journeyworker	\$ 34.59
Glass tinting & Window Film	20.29
Repair & Maintenance	20.29

**OVERTIME PAY**

See (B,H,V) on OVERTIME PAGE.

For 'Repair & Maintenance' and 'Glass Tinting & Window Film' see (B, B2, I, S) on overtime page.

**HOLIDAY**

Paid: See (1) on HOLIDAY PAGE  
 Overtime: See (4, 6, 16, 25) on HOLIDAY PAGE  
 For 'Repair & Maintenance' and 'Glass Tinting & Window Film' Only  
 Paid: See(5, 6, 16, 25)  
 Overtime: See(5, 6, 16, 25)

**REGISTERED APPRENTICES**

Wage per hour:

(1) year terms at the following wage rates:

	7/01/2020
1st term	\$ 20.14
2nd term	28.21
3rd term	34.10
4th term	45.80

Supplemental Benefits:

(Per hour)

1st term	\$ 16.16
2nd term	22.76
3rd term	25.16
4th term	29.73

8-1087 (DC9 NYC)

**Insulator - Heat & Frost** **07/01/2020**

**JOB DESCRIPTION** Insulator - Heat & Frost

**DISTRICT 8**

**ENTIRE COUNTIES**

Dutchess, Orange, Putnam, Rockland, Westchester

**WAGES**

Per hour:	07/01/2020	05/31/2021
Insulator	\$ 55.00	\$ 2.00
Discomfort & Additional Training**	57.96	
Fire Stop Work*	29.44	

\* 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	\$ 34.35
Discomfort & Additional Training	36.30
Fire Stop Work: Journeyworker	17.52

**OVERTIME PAY**

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

**HOLIDAY**

Paid: See (1) on HOLIDAY PAGE

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.

Overtime: See ( 2\*, 4, 6, 16, 25 ) on HOLIDAY PAGE.

\*Note: Labor Day triple time if worked.

**REGISTERED APPRENTICES**

(1) year terms:

Insulator Apprentices:			
1st	2nd	3rd	4th
\$ 29.44	\$ 34.55	\$ 39.66	\$ 44.78

Discomfort & Additional Training Apprentices:			
1st	2nd	3rd	4th
\$ 30.99	\$ 36.41	\$ 41.83	\$ 47.26

Supplemental Benefits paid per hour:

Insulator Apprentices:	
1st term	\$ 17.52
2nd term	20.89
3rd term	24.25
4th term	27.61

Discomfort & Additional Training Apprentices:	
1st term	\$ 18.50
2nd term	22.06
3rd term	25.62
4th term	29.18

**ENTIRE COUNTIES**

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

**WAGES**

Per Hour:	07/01/2020	01/01/2021
		Additional
Ironworker Rigger	\$ 67.13	\$ 1.36

Ironworker Stone Derrickman	\$ 67.13
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**SUPPLEMENTAL BENEFITS**

Per hour:	\$ 40.94
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**OVERTIME PAY**

See (B, D1, \*E, Q, \*\*V) on OVERTIME PAGE

\*Time and one-half shall be paid for all work on Saturday up to eight (8) hours and double time shall be paid for all work thereafter.

\*\* Benefits same premium as wages on Holidays only

**HOLIDAY**

Paid:	See (18) on HOLIDAY PAGE
Overtime:	See (5, 6, 8, 25) on HOLIDAY PAGE

\*Work stops at schedule lunch break with full day's pay.

**REGISTERED APPRENTICES**

Wage per hour:

1/2 year terms at the following hourly wage rate:

	1st	2nd	3rd	4th
07/01/2020	\$33.12	\$47.19	\$52.50	\$57.82

Supplemental benefits:

Per hour:	\$20.93	\$31.23	\$31.23	\$31.23
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9-197D/R

**Ironworker**

**07/01/2020**

**JOB DESCRIPTION** Ironworker

**DISTRICT 4**

**ENTIRE COUNTIES**

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

**WAGES**

Per Hour:	07/01/2020	01/01/2021
		Additional
Ornamental	\$ 45.65	\$ 1.25
Chain Link Fence	45.65	
Guide Rail	45.65	

**SUPPLEMENTAL BENEFITS**

Per hour:	
Journeyworker:	\$ 58.05

**OVERTIME PAY**

See (B, B1, Q, V) on OVERTIME PAGE

**HOLIDAY**

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

**REGISTERED APPRENTICES**

Apprentices hired before 8/31/2018:

(1/2) year terms at the following percentage of Journeyman's wage.

5th Term	80%
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Supplemental Benefits per hour:

5th Term	52.38
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Apprentices Hired after 9/1/18:

1 year terms

1st Term	\$ 21.13
2nd Term	24.77
3rd Term	36.32
4th Term	TBD

Supplemental Benefits per hour:

1st Term	\$ 17.61
2nd Term	18.86
3rd Term	52.58
4th Term	TBD

4-580-Or

**Ironworker**

**07/01/2020**

**JOB DESCRIPTION** Ironworker

**DISTRICT 4**

**ENTIRE COUNTIES**

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

**WAGES**

PER HOUR:

07/01/2020	01/01/2021
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Ironworker:

Structural	\$ 52.70
Bridges	
Machinery	

Additional

\$1.75/Hr.

**SUPPLEMENTAL BENEFITS**

PER HOUR:

Journeyman	\$ 81.35
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**OVERTIME PAY**

See (B, B1, Q) on OVERTIME PAGE

**HOLIDAY**

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 18, 19) on HOLIDAY PAGE

**REGISTERED APPRENTICES**

WAGES PER HOUR:

6 month terms at the following rate:

1st	\$27.45
2nd	\$28.05
3rd - 6th	\$28.66

Supplemental Benefits

PER HOUR:

All Terms	\$56.15
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4-40/361-Str

**Ironworker**

**07/01/2020**

**JOB DESCRIPTION** Ironworker

**DISTRICT 4**

**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: 07/01/2020

Reinforcing & Metal Lathing	\$ 56.23
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"Base" Wage	\$ 54.65 plus \$ 1.58
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"Base" Wage is used to calculate overtime hours only.

**SUPPLEMENTAL BENEFITS**

Per hour:

Reinforcing &	\$ 35.30
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Metal Lathing

**OVERTIME PAY**

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

\*Only \$22.00 per Hour for non worked hours

Supplemental Benefit Premiums for Overtime Hours worked:

Time & One Half	\$ 41.55
Double Time	\$ 47.80

**HOLIDAY**

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 11, 13, 18, 19, 25) on HOLIDAY PAGE

**REGISTERED APPRENTICES**

(1) year terms at the following wage rates:

Wages Per Hour:

1st term	2nd term	3rd term	4th Term
\$ 26.38	\$ 30.38	\$ 35.38	\$ 37.38

**SUPPLEMENTAL BENIFITS**

Per Hour:

1st term	2nd term	3rd term	4th Term
\$ 15.37	\$ 17.37	\$ 19.33	\$ 20.33

4-46Reinf

**Laborer - Building**

**07/01/2020**

**JOB DESCRIPTION** Laborer - Building

**DISTRICT 8**

**ENTIRE COUNTIES**

Putnam, Westchester

**WAGES**

07/01/2020

Laborer \$ 35.30  
 plus \$4.60\*\*

Laborer - Asbestos & Hazardous  
 Materials Removal \$ 41.55\*

\* Abatement/Removal of:

- Lead based or lead containing paint on materials to be repainted is classified as Painter.
- Asbestos containing roofs and roofing material is classified as Roofer.

\*\* This portion is not subject to overtime premium.

NOTE: Upgrade/Material condition work plan for work performed during non-outage under a wage formula of 90% wage/100% fringe benefits at nuclear power plants.

**SUPPLEMENTAL BENEFITS**

Per hour: 07/01/2020

Journeyworker \$ 26.40

**OVERTIME PAY**

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

\*Note: For Sundays and Holidays worked benefits are at the same premium as wages.

**HOLIDAY**

Paid: See (1) on HOLIDAY PAGE

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

**REGISTERED APPRENTICES**

LABORER ONLY

Hourly terms at the following wage:

Level A	Level B	Level C	Level D	Level E
0-1000	1001-2000	2001-3000	3001-4000	4001+
\$ 23.90	\$ 27.50	\$ 31.50	\$ 38.00	\$ 39.80

Supplemental Benefits per hour:

Apprentices	
Level A	\$ 12.35
Level B	15.20
Level C	17.80
Level D	18.20
Level E	26.40

8-235/B

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**Laborer - Heavy&Highway** **07/01/2020**

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**JOB DESCRIPTION** Laborer - Heavy&Highway

**DISTRICT** 8

**ENTIRE COUNTIES**

Putnam, Westchester

**WAGES**

\*\*PUTNAM: APPLIES TO ALL HEAVY & HIGHWAY WORK EXCLUDING HIGHWAYS, STREETS, AND BRIDGES\*\*

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GROUP I: Blaster and Quarry Master

GROUP II: Burner, Drillers(jumbo, joy, wagon, air track, hydraulic), Drill Operator, Self Contained Rotary Drill, Curbs/ Asphalt Screedman/Raker, Bar Person.

GROUP III: Pavement Breakers, Jeeper Operator, Jack Hammer, Pneumatic Tools (all), Gas Driller, Guniting, Railroad Spike Puller, Pipelayer, Chain Saw, Deck winches on scows, Power Buggy Operator, Power Wheelbarrow Operator, Bar Person Helper.

GROUP IV: Concrete Laborers, Asph. Worker, Rock Scaler, Vibrator Oper., Bit Grinder, Air Tamper, Pumps, Epoxy (adhesives, fillers and troweled on), Barco Rammer, Concrete Grinder, Crack Router Operator, Guide Rail-digging holes and placing concrete and demolition when not to be replaced, distribution of materials and tightening of bolts.

GROUP V: Drillers Helpers, Common Laborer, Mason Tenders, Signal Person, Pit Person, Truck Spotter, Powder Person, Landscape/Nursery Person, Dump Person, Temp. Heat.

GROUP VIA: Asbestos/Toxic Waste Laborer-All removal (Roads, Tunnels, Landfills, etc.) Confined space laborer

Wages:(per hour) 07/01/2020

GROUP I	\$44.45*
GROUP II	43.10*
GROUP III	42.70*
GROUP IV	42.35*
GROUP V	42.00*
GROUP VIA	44.00*
Operator Qualified	
Gas Mechanic	54.45*
Flagperson	35.65*

\*NOTE: To calculate overtime premiums, deduct \$0.10 from above wages

SHIFT WORK: A shift premium will be paid on Public Work contracts for off-shift or irregular shift work when mandated by the NYS D.O.T. or other Governmental Agency contracts. Employees shall receive an additional 15% per hour above current rate for all regular and irregular shift work. Premium pay shall be calculated using the 15% per hour differential as base rate.

**SUPPLEMENTAL BENEFITS**

Per hour:

Journeyworker:

First 40 Hours	
Per Hour	\$24.35
Over 40 Hours	
Per Hour	18.10

**OVERTIME PAY**

See (B, E, P, R, S) on OVERTIME PAGE

**HOLIDAY**

Paid: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE  
 Overtime: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE

NOTE: For Holiday Overtime: 5, 6 - Code 'S' applies  
 For Holiday Overtime: 8, 9, 15, 25 - Code 'R' applies

**REGISTERED APPRENTICES**

	1st term 1-1000hrs	2nd term 1001-2000hrs	3rd term 2001-3000hrs	4th term 3001-4000hrs
07/01/2020	\$ 23.90	\$ 28.20	\$ 32.50	\$ 36.70

Supplemental Benefits per hour:

1st term	\$ 3.85 - After 40 hours: \$ 3.60
2nd term	\$ 3.95 - After 40 hours: \$ 3.60
3rd term	\$ 4.45 - After 40 hours: \$ 4.00
4th term	\$ 5.00 - After 40 hours: \$ 4.50

8-60H/H

**Laborer - Tunnel**

**07/01/2020**

**JOB DESCRIPTION** Laborer - Tunnel

**DISTRICT** 11

**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)

	07/01/2020	07/01/2021	07/01/2022
Class 1	\$ 50.45	\$ 51.95	\$ 53.45
Class 2	52.60	54.10	55.60
Class 4	59.00	60.50	62.00
Class 5	42.25	43.50	44.80

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

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	\$ 32.15	\$ 33.25	\$ 34.45
Benefit 2	48.15	49.80	51.60
Benefit 3	64.15	66.35	68.75

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.

Benefit 3 applies to Sunday and Holiday hours worked.

**OVERTIME PAY**

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

**HOLIDAY**

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

Overtime: 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**

**07/01/2020**

**JOB DESCRIPTION** Lineman Electrician

**DISTRICT 6**

**ENTIRE COUNTIES**  
Westchester

**WAGES**

Below rates apply to electrical overhead and underground distribution and maintenance work and overhead and underground transmission line work, electrical substations, switching structures, continuous pipe-type underground fluid or gas filled transmission conduit and cable installations, maintenance jobs or projects, railroad catenary installations and maintenance, third rail installations, the bonding of rails and the installation of fiber optic cable. (Ref #14.04.01)

Includes Teledata Work performed within ten (10) feet of high voltage (600 volts or over) transmission lines.

Per hour: 07/01/2020

Lineman, Tech, Welder	\$ 56.51
Crane, Crawler Backhoe	56.51
Cable Splicer-Pipe Type	62.16
Digging Mach Operator	50.86
Cert. Welder-Pipe Type	59.34
Tractor Trailer Driver	48.03
Groundman, Truck Driver	45.21
Equipment Mechanic	45.21
Flagman	33.91

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

NOTE: 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%

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day. Tuesday thru Friday may be worked with no make-up day.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

**SUPPLEMENTAL BENEFITS**

Per hour worked (but also required on non-worked holidays):

Journeyman	\$ 24.90
	*plus 6.75% of hourly wage

\*The 6.75% is based on the hourly wage paid, straight time or premium time.

**OVERTIME PAY**

See ( B, E, Q, ) on OVERTIME PAGE. \*Note\* Double time for emergency work designated by the Dept of Jurisdiction.

NOTE: 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 plus Governor of NYS Election Day.
Overtime	See ( 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.

1st term	\$ 33.91
2nd term	36.73
3rd term	39.56
4th term	42.38
5th term	45.21
6th term	48.03
7th term	50.86

SUPPLEMENTAL BENEFITS per hour: Same as Journeyman

6-1249aWest

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**Lineman Electrician - Teledata** **07/01/2020**

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**JOB DESCRIPTION** Lineman Electrician - Teledata

**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, Westchester, Wyoming, Yates

**WAGES**

Per hour:

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

	07/01/2020	01/01/2021
Cable Splicer	\$ 33.77	\$ 34.78
Installer, Repairman	\$ 32.05	\$ 33.01
Teledata Lineman	\$ 32.05	\$ 33.01
Tech., Equip. Operator	\$ 32.05	\$ 33.01
Groundman	\$ 16.99	\$ 17.50

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

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

1ST SHIFT	REGULAR RATE
2ND SHIFT	REGULAR RATE PLUS 10%
3RD SHIFT	REGULAR RATE PLUS 15%

**SUPPLEMENTAL BENEFITS**

Per hour:

Journeyman	\$ 5.06	\$ 5.06
	*plus 3% of wage paid	*plus 3% of 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

NOTE: 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

6-1249LT - Teledata

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**Lineman Electrician - Traffic Signal, Lighting** **07/01/2020**

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**JOB DESCRIPTION** Lineman Electrician - Traffic Signal, Lighting

**DISTRICT 6**

**ENTIRE COUNTIES**

Westchester

**WAGES**

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.

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.  
(Ref #14.01.03)

Per hour: 07/01/2020

Lineman, Technician	\$ 51.61
Crane, Crawler Backhoe	51.61
Certified Welder	54.19
Digging Machine	46.45
Tractor Trailer Driver	43.87
Groundman, Truck Driver	41.29
Equipment Mechanic	41.29
Flagman	30.97

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.

NOTE: 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%

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day. Tuesday thru Friday may be worked with no make-up day.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

### SUPPLEMENTAL BENEFITS

Per hour worked (but also required on non-worked holidays):

Journeyman	\$ 24.90
	*plus 6.75% of hourly wage

\*The 6.75% is based on the hourly wage paid, straight time rate or premium rate.  
Supplements paid at STRAIGHT TIME rate for holidays.

### OVERTIME PAY

See (B, E, Q) on OVERTIME PAGE. \*Note\* Double time for emergency work designated by the Dept. of Jurisdiction.

NOTE: 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.

1st term	\$ 30.97
2nd term	33.55
3rd term	36.13
4th term	38.71
5th term	41.29
6th term	43.87
7th term	46.45

SUPPLEMENTAL BENEFITS per hour: Same as Journeyman

6-1249aWestLT

**Mason - Building** **07/01/2020**

**JOB DESCRIPTION** Mason - Building

**DISTRICT 9**

**ENTIRE COUNTIES**  
 Nassau, Rockland, Suffolk, Westchester

**WAGES**

Per hour:	07/01/2020	12/07/2020
		Additional
Tile Setters	\$ 60.09	\$0.88

**SUPPLEMENTAL BENEFITS**

Per Hour:	\$ 24.81*
	+ \$9.72

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

**OVERTIME PAY**

See (B, E, Q, V) on OVERTIME PAGE  
 Work beyond 10 hours on Saturday shall be paid at double the hourly wage rate.

**HOLIDAY**

Paid: See (1) on HOLIDAY PAGE  
 Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

**REGISTERED APPRENTICES**

Wage per hour:

Tile Setters:  
 (750 hour) term at the following wage rate:

Term:	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
	1-750	751-1500	1501-2250	2251-3000	3001-3750	3751-4500	4501-5250	5251-6000	6001-6750	6501-7000
07/01/2020	\$20.35	\$25.11	\$32.09	\$36.83	\$40.25	\$43.50	\$46.95	\$51.69	\$54.34	\$58.19

Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$12.55*	\$12.55*	\$15.06*	\$15.06*	\$16.06*	\$17.56*	\$18.56*	\$18.56*	\$16.56*	\$21.81*
+\$0.66	+\$0.70	+\$0.80	+\$0.85	+\$1.23	+\$1.27	+\$1.62	+\$1.67	+\$5.82	+\$6.31

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

9-7/52A

**Mason - Building** **07/01/2020**

**JOB DESCRIPTION** Mason - Building

**DISTRICT 11**

**ENTIRE COUNTIES**  
 Putnam, Rockland, Westchester

**PARTIAL COUNTIES**  
 Orange: Only the Township of Tuxedo.

**WAGES**

Per hour:

07/01/2020

Bricklayer	\$ 42.09
Cement Mason	42.09
Plasterer/Stone Mason	42.09
Pointer/Caulker	42.09

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 work day is mandated or required by state, federal, county, local or other governmental agency contracts, the following premiums apply:

- Irregular work day 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	\$ 35.00
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**OVERTIME PAY**

OVERTIME:

Cement Mason	See ( B, E, Q, W ) on OVERTIME PAGE.
All Others	See ( B, E, Q ) on OVERTIME PAGE.

**HOLIDAY**

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

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

11-5wp-b

**Mason - Building**

**07/01/2020**

**JOB DESCRIPTION** Mason - Building

**DISTRICT 9**

**ENTIRE COUNTIES**

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

**WAGES**

Building:

Wages per hour:	07/01/2020	01/01/2021
		Additional \$0.95

Mosaic & Terrazzo Mechanic	\$57.42
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Mosaic & Terrazzo Finisher	\$55.82
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**SUPPLEMENTAL BENEFITS**

Per hour:

Mosaic & Terrazzo Mechanic	\$ 25.61* + \$11.47
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Mosaic & Terrazzo Finisher	\$ 25.61*
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+ \$11.45

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

**OVERTIME PAY**

See (A, E, Q) on OVERTIME PAGE

Deduct \$6.60 from hourly wages before calculating overtime.

**HOLIDAY**

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

Easter Sunday is an observed holiday. Holidays falling on a Saturday will be observed on that Saturday. Holidays falling on a Sunday will be celebrated on the Monday.

**REGISTERED APPRENTICES**

Wages per hour:

(750 Hour) terms at the following wage rate.

	1st	2nd	3rd	4th	5th	6th	7th	8th
07/01/2020	\$25.40	\$27.94	\$30.49	\$33.03	\$35.57	\$38.11	\$43.20	\$48.28

Supplemental benefits per hour:

07/01/2020	\$ 12.81*	\$ 14.09*	\$ 15.37*	\$ 16.65*	\$ 17.93*	\$ 19.21*	\$ 21.77*	\$ 24.33*
	+\$9.04	+\$9.94	+\$10.84	+\$11.75	+\$12.65	+\$13.55	+\$15.36	+\$17.16

Apprentices hired after 07/01/2017:

Wages Per hour:

	1st 0- 1500	2nd 1501- 3000	3rd 3001- 3750	4th 3751- 4500	5th 4501- 5250	6th 5251- 6000
07/01/2020	\$22.20	\$22.88	\$30.49	\$35.57	\$40.65	\$45.73

Supplemental Benefits per hour:

07/01/2020	1st \$4.55*	2nd \$11.52*	3rd \$15.37*	4th \$17.93*	5th \$20.49*	6th \$23.05*
	+\$6.32	+\$8.13	+\$10.84	+\$12.65	+\$14.46	+\$16.22

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

9-7/3

**Mason - Building**

**07/01/2020**

**JOB DESCRIPTION** Mason - Building

**DISTRICT** 9

**ENTIRE COUNTIES**

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

**WAGES**

Per hour: 07/01/2020 01/01/2021

Building-Marble Restoration: Additional \$1.10

Marble, Stone & Terrazzo Polisher, etc \$ 44.66

**SUPPLEMENTAL BENEFITS**

Per Hour:

Journeyworker:

Building-Marble Restoration:  
 Marble, Stone & Polisher \$ 28.41

**OVERTIME PAY**

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

\*ON SATURDAYS, 8TH HOUR AND SUCCESSIVE HOURS PAID AT DOUBLE HOURLY RATE.

**HOLIDAY**

Paid: See (1) on HOLIDAY PAGE  
 Overtime: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE  
 1ST TERM APPRENTICE GETS PAID FOR ALL OBSERVED HOLIDAYS.

**REGISTERED APPRENTICES**

WAGES per hour:

900 hour term at the following wage:

	1st 1- 900	2nd 901- 1800	3rd 1801- 2700	4th 2701
07/01/2020	\$31.19	\$35.68	\$40.16	\$44.66

Supplemental Benefits Per Hour:

07/01/2020	\$ 25.78	\$ 26.66	\$ 27.54	\$ 28.41
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9-7/24-MP

**Mason - Building**

**07/01/2020**

**JOB DESCRIPTION** Mason - Building

**DISTRICT 9**

**ENTIRE COUNTIES**

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

**WAGES**

Wages:	07/01/2020	01/14/2021
Marble Cutters & Setters	\$ 60.35	\$0.95

**SUPPLEMENTAL BENEFITS**

Per Hour:

Journeyworker	\$ 37.24
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**OVERTIME PAY**

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

**HOLIDAY**

Paid: See (1) on HOLIDAY PAGE  
 Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

**REGISTERED APPRENTICES**

Wage Per Hour:

750 hour terms at the following wage.

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	
1- 750	751- 1500	1501- 2250	2251- 3000	3001- 3750	3751- 4500	4501- 5250	5251- 6000	6001- 6751	6751- 7500	
07/01/2020	\$24.15	\$27.15	\$30.16	\$33.19	\$36.20	\$39.20	\$42.15	\$45.26	\$51.28	\$57.34

Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$20.14	\$21.58	\$23.02	\$24.42	\$25.85	\$27.29	\$28.72	\$30.12	\$32.98	\$35.81

9-7/4

**Mason - Building**

**07/01/2020**

**JOB DESCRIPTION** Mason - Building

**DISTRICT 9**

**ENTIRE COUNTIES**

Nassau, Rockland, Suffolk, Westchester

**WAGES**

Per hour:	07/01/2020	12/07/2020
		Additional
Tile Finisher	\$ 46.21	\$0.73

**SUPPLEMENTAL BENEFITS**

Per Hour:

	\$ 21.56*
	+ \$9.65

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

**OVERTIME PAY**

See (B, E, Q, \*V) on OVERTIME PAGE  
 Work beyond 10 hours on a Saturday shall be paid at double the hourly wage rate.

**HOLIDAY**

Paid: See (1) on HOLIDAY PAGE  
 Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

9-7/88A-tf

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**Mason - Building** **07/01/2020**

**JOB DESCRIPTION** Mason - Building **DISTRICT 9**

**ENTIRE COUNTIES**  
 Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

**WAGES**

Per hour:	07/01/2020	01/01/2021
Marble, Stone, etc.		Additional
Maintenance Finishers:	\$ 25.53	\$0.68

Note 1: An additional \$2.00 per hour for time spent grinding floor using "60 grit" and below.  
 Note 2: Flaming equipment operator shall be paid an additional \$25.00 per day.

**SUPPLEMENTAL BENEFITS**

Per Hour:

Marble, Stone, etc	
Maintenance Finishers:	\$ 13.85

**OVERTIME PAY**

See (B, \*E, Q, V) on OVERTIME PAGE  
 \*Double hourly rate after 8 hours on Saturday

**HOLIDAY**

Paid: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE  
 Overtime: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE  
 1st term apprentice gets paid for all observed holidays.

**REGISTERED APPRENTICES**

WAGES per hour:

	07/01/2020
0-750	\$17.87
751-1500	\$18.89
1501-2250	\$19.92
2251-3000	\$20.93
3001-3750	\$22.47
3751-4500	\$24.51
4501+	\$25.53

**Supplemental Benefits:**

Per hour:

0-750	\$ 13.73
751-1500	\$ 13.75
1501-2250	\$ 13.76
2251-3000	\$ 13.78

3001-3750	\$ 13.80
3751-4500	\$ 13.83
4501+	\$ 13.85

9-7/24M-MF

**Mason - Building / Heavy&Highway**

**07/01/2020**

**JOB DESCRIPTION** Mason - Building / Heavy&Highway

**DISTRICT 9**

**ENTIRE COUNTIES**

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

**WAGES**

Per hour:	07/01/2020	01/14/2021
Marble-Finisher	\$ 47.92	Additional \$0.61

**SUPPLEMENTAL BENEFITS**

Journeyworker:  
per hour

Marble- Finisher \$ 34.99

**OVERTIME PAY**

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

**HOLIDAY**

Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

\* Work beyond 8 hours on a Saturday shall be paid at double the rate.

\*\* When an observed holiday falls on a Sunday, it will be observed the next day.

9-7/20-MF

**Mason - Heavy&Highway**

**07/01/2020**

**JOB DESCRIPTION** Mason - Heavy&Highway

**DISTRICT 11**

**ENTIRE COUNTIES**

Putnam, Rockland, Westchester

**PARTIAL COUNTIES**

Orange: Only the Township of Tuxedo.

**WAGES**

Per hour:	07/01/2020
Bricklayer	\$ 42.60
Cement Mason	42.60
Marble/Stone Mason	42.60
Plasterer	42.60
Pointer/Caulker	42.60

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 work day is mandated or required by state, federal, county, local or other governmental contracts, the following rates apply:

Irregular work day 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 \$ 34.99

**OVERTIME PAY**

Cement Mason See ( B, E, Q, W, X )

All Others See ( B, E, Q, X )

**HOLIDAY**

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

Overtime: See (5, 6, 15, 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:

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

11-5WP-H/H

**Operating Engineer - Building**

**07/01/2020**

**JOB DESCRIPTION** Operating Engineer - Building

**DISTRICT 9**

**ENTIRE COUNTIES**

Bronx, Kings, New York, Putnam, Queens, Richmond, Westchester

**PARTIAL COUNTIES**

Dutchess: that part of Dutchess County lying south of the North City Line of the City of Poughkeepsie.

**WAGES**

NOTE:Construction surveying

Party chief--One who directs a survey party

Instrument Man--One who runs the instrument and assists Party Chief.

Rodman--One who holds the rod and assists the Survey Crew

Wages:(Per Hour) 07/01/2020

Building Construction:

Party Chief	\$ 74.75
Instrument Man	\$ 59.53
Rodman	\$ 40.79

Steel Erection:

Party Chief	\$ 78.44
Instrument Man	\$ 62.74
Rodman	\$ 44.39

Heavy Construction-NYC counties only:  
 (Foundation, Excavation.)

Party Chief	\$ 83.87
Instrument man	\$ 63.61
Rodman	\$ 54.59

**SUPPLEMENTAL BENEFITS**

Per Hour: 07/01/2020

Building Construction & Steel \$ 22.85\* + 6.90

Heavy Construction \$ 23.10\* + 6.90

\* This portion subject to same premium as wages

Non-Worked Holiday Supplemental Benefit:  
 \$ 16.45

**OVERTIME PAY**

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

Code "A" applies to Building Construction and has double the rate after 7 hours on Saturdays.

Code "B" applies to Heavy Construction and Steel Erection and had double the rate after 8 hours on Saturdays.

**HOLIDAY**

Paid: See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE

9-15Db

**Operating Engineer - Building**

**07/01/2020**

**JOB DESCRIPTION** Operating Engineer - Building

**DISTRICT 8**

**ENTIRE COUNTIES**

Putnam, Westchester

**PARTIAL COUNTIES**

Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

**WAGES**

**GROUP I:**

Cranes (All Types up to 49 tons), Boom Trucks, Cherry Pickers (All Types), Clamshell Crane, Derrick (Stone and Steel), Dragline, Franki Pile Rig or similar, High Lift (Lull or similar) with crane attachment and winch used for hoisting or lifting, Hydraulic Cranes, Pile Drivers, Potain and similar.

Cranes (All types 50-99 tons), Drill Rig Casa Grande (CAT or similar), Franki Pile Rig or similar, Hydraulic Cranes (All types including Crawler Cranes- No specific boom length).

Cranes (All types 100 tons and over), All Tower Cranes, All Climbing Cranes irrespective of manufacturer and regardless of how the same is rigged, Franki Pile Rig or similar, Conventional Cranes (All types including Crawler Cranes-No specific boom length), Hydraulic Cranes.

GROUP I-A: Barber Green Loader-Euclid Loader, Bulldozer, Carrier-Trailer Horse, Concrete Cleaning Decontamination Machine Operator, Concrete-Portable Hoist, Conway or Similar Mucking Machines, Elevator & Cage, Excavators all types, Front End Loaders, Gradall, Shovel, Backhoe, etc.(Crawler or Truck), Heavy Equipment Robotics Operator/Mechanic, Hoist Engineer-Material, Hoist Portable Mobile Unit, Hoist(Single, Double or Triple Drum), Horizontal Directional Drill Locator, Horizontal Directional Drill Operator and Jersey Spreader, Letourneau or Tournapull(Scrapers over 20 yards Struck), Lift Slab Console, etc., Lull HiLift or Similar, Master Environmental Maintenance Mechanics, Mucking Machines Operator/Mechanic or Similar Type, Overhead Crane, Pavement Breaker(Air Ram), Paver(Concrete), Post Hole Digger, Power House Plant, Road Boring Machine, Road Mix Machine, Ross Carrier and Similar Machines, Rubber tire double end backhoes and similar machines, Scoopmobile Tractor-Shovel Over 1.5 yards, Shovel (Tunnels), Spreader (Asphalt) Telephie(Cableway), Tractor Type Demolition Equipment, Trenching Machines-Vermeer Concrete Saw Trencher and Similar, Ultra High Pressure Waterjet Cutting Tool System, Vacuum Blasting Machine operator/mechanic, Winch Truck A Frame.

GROUP I-B: Compressor (Steel Erection), Mechanic (Outside All Types), Negative Air Machine (Asbestos Removal), Push Button (Buzz Box) Elevator.

GROUP II: Compactor Self-Propelled, Concrete Pump, Crane Operator in Training (Over 100 Tons), Grader, Machines Pulling Sheep's Foot Roller, Roller (4 ton and over), Scrapers (20 yards Struck and Under), Vibratory Rollers, Welder.

GROUP III-A: Asphalt Plant, Concrete Mixing Plants, Forklift (All power sources), Joy Drill or similar, Tractor Drilling Machine, Loader (1 1/2 yards and under), Portable Asphalt Plant, Portable Batch Plant, Portable Crusher, Skid Steer (Bobcat or similar), Stone Crusher, Well Drilling Machine, Well Point System.

GROUP III-B: Compressor Over 125 cu.Feet, Conveyor Belt Machine regardless of size, Compressor Plant, Ladder Hoist, Stud Machine.

GROUP IV-A: Batch Plant, Concrete Breaker, Concrete Spreader, Curb Cutter Machine, Finishing Machine-Concrete, Fine Grading Machine, Hepa Vac Clean Air Machine, Material Hopper(sand, stone, cement), Mulching Grass Spreader, Pump Gypsum etc, Pump-Plaster-Grout-Fireproofing. Roller(Under 4 Ton), Spreading and Fine Grading Machine, Steel Cutting Machine, Siphon Pump, Tar Joint Machine, Television Cameras for Water, Sewer, Gas etc. Turbo Jet Burner or Similar Equipment, Vibrator (1 to 5).

GROUP IV-B: Compressor (all types), Heater (All Types), Fire Watchman, Lighting Unit (Portable & Generator) Pump, Pump Station(Water, Sewer, Portable, Temporary), Welding Machine (Steel Erection & Excavation).

GROUP V: Mechanics Helper, Motorized Roller (walk behind), Stock Attendant, Welder's Helper.

GROUP VI-B: Utility Man, Warehouse Man.

WAGES: (per hour)

07/01/2020

GROUP I	
Cranes- up to 49 tons	\$ 61.70
Cranes- 50 tons to 99 tons	63.86
Cranes- 100 tons and over	72.99
GROUP I-A	53.95
GROUP I-B	49.68
GROUP II	52.03
GROUP III-A	50.11
GROUP III-B	47.67
GROUP IV-A	49.60
GROUP IV-B	41.85
GROUP V	45.17
GROUP VI-A	52.96
GROUP VI-B	
Utility Man	42.83
Warehouse Man	44.92

An additional 20% to wage when required to wear protective equipment on hazardous/toxic waste projects.  
 Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional \$2.00 per hour.  
 Engineers operating cranes with booms 149 feet or over in length will be paid an additional \$3.00 per hour.  
 Loader operators over 5 cubic yard capacity additional .50 per hour.  
 Shovel operators over 4 cubic yard capacity additional \$1.00 per hour.

**SUPPLEMENTAL BENEFITS**

Per hour:

07/01/2020

Journeyworker	\$ 28.52
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**OVERTIME PAY**

OVERTIME:..... See ( B, E,P,R\*,T\*\*,U\*\*\*,V ) on OVERTIME PAGE.

**HOLIDAY**

Paid:..... See ( 5, 6, 11, 12, 15, 25 ) on HOLIDAY PAGE.  
 Overtime:..... See ( 5, 6, 11, 12, 15, 25 ) on HOLIDAY PAGE.  
 \* For Holiday codes 11, 12, 15, 25, code R applies.  
 \*\* For Holiday code 28, code T applies  
 \*\*\* For Holiday codes 5 & 6, code U applies

8-137B

**Operating Engineer - Heavy&Highway**

**07/01/2020**

**JOB DESCRIPTION** Operating Engineer - Heavy&Highway

**DISTRICT 8**

**ENTIRE COUNTIES**

Putnam, Westchester

**PARTIAL COUNTIES**

Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

**WAGES**

GROUP I: Boom Truck, Cherry Picker, Clamshell, Crane, (Crawler, Truck), Dragline, Drill Rig (Casa Grande, Cat, or Similar), Floating Crane (Crane on Barges) under 100 tons, Gin Pole, Hoist Engineer-Concrete (Crane-Derrick-Mine Hoist), Knuckle Boom Crane, Rough Terrain Crane.

GROUP I-A: Auger (Truck or Truck Mounted), Boat Captain, Bulldozer-All Sizes, Central Mix Plant Operator, Chipper (all types), Close Circuit T.V., Combination Loader/Backhoe, Compactor with Blade, Concrete Finishing Machine, Gradall, Grader (Motor Grader), Elevator & Cage (Materials or Passenger), Excavator (and all attachments), Front End Loaders (1 1/2 yards and over), High Lift Lull and similar, Hoist (Single, Double, Triple Drum), Hoist Portable Mobile Unit, Hoist Engineer (Material), Jack and Bore Machine, Log Skidders, Mill Machines, Mucking Machines, Overhead Crane, Paver (concrete), Post Pounder (of any type), Push Cats, Road Reclaimer, Robot Hammer (Brokk or similar), Robotic Equipment (Scope of Engineer Schedule), Ross Carrier and similar, Scrapers (20 yard struck and over), Side Boom, Slip Form Machine, Spreader (Asphalt), Trenching Machines (Telephies-Vermeer Concrete Saw), Tractor Type Demolition Equipment, Vacuum Truck.

GROUP I-B: Asphalt Mobile Conveyor/Transfer Machine, Road Paver (Asphalt).

GROUP II-A: Ballast Regulators, Compactor Self Propelled, Fusion Machine, Rail Anchor Machines, Roller (4 ton and over), Scrapers (20 yard struck and under), Vibratory Roller (Riding), Welder.

GROUP II-B: Mechanic (Outside) All Types.

GROUP III: Air Tractor Drill, Asphalt Plant, Batch Plant, Boiler (High Pressure), Concrete Breaker (Track or Rubber Tire), Concrete Pump, Concrete Spreader, Excavator Drill, Farm Tractor, Forklift (all types), Gas Tapping (Live), Hydroseeder, Loader (1 1/2 yards and under), Locomotive (all sizes), Machine Pulling Sheeps Foot Roller, Portable Asphalt Plant, Portable Batch Plant, Portable Crusher (Apprentice), Powerhouse Plant, Roller (under 4 ton), Sheer Excavator, Skid Steer/Bobcat, Stone Crusher, Sweeper (with seat), Well Drilling Machine.

GROUP IV: Service Person (Grease Truck).

GROUP IV-B: Conveyor Belt Machine (Truck Mounted), Heater (all types), Lighting Unit (Portable), Maintenance Engineer (For Crane Only), Mechanics Helper, Pump (Fireproofing), Pumps-Pump Station/Water/Sewer/Gypsum/Plaster, etc., Pump Truck (Sewer Jet or Similar), Welders Helper, Welding Machine (Steel Erection), Well Point System.

GROUP V: All Tower Cranes-All Climbing Cranes and all cranes of 100-ton capacity or greater (3900 Manitowac or similar) irrespective of manufacturer and regardless of how the same is rigged, Hoist Engineer (Steel), Engineer-Pile Driver, Jersey Spreader, Pavement Breaker/Post Hole Digger.

WAGES: Per hour: 07/01/2020

Group I	\$ 62.38
Group I-A	54.95
Group I-B	57.92
Group II-A	52.61
Group II-B	54.26
Group III	51.68
Group IV-A	46.93
Group IV-B	40.24
Group V-A	
Engineer All Tower, Climbing and Cranes of 100 Tons	70.72
Hoist Engineer(Steel)	64.00
Engineer(Pile Driver)	68.27
Jersey Spreader,Pavement Breaker (Air Ram)Post Hole Digger	53.83

**SHIFT DIFFERENTIAL:**

A 15% premium on all hours paid, including overtime hours for 2nd, 3rd shifts on all government mandated off-shift work

Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional \$2.00 per hour over the rate listed in the Wage Schedule. Engineers operating cranes with booms 149 feet or over in length will be paid an additional \$3.00 per hour over the rate listed in the Wage Schedule. Loader and Excavator Operators: over 5 cubic yards capacity \$0.50 per hour over the rate listed in the Wage Schedule. Shovel Operators: over 4 cubic yards capacity \$1.00 per hour over the rate listed in the Wage Schedule.

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday; Friday may be used as a make-up day.

NOTE - In order to use the 4 Day/10 Hour Work schedule Registration for Use of 4 Day/10 Hour Work Schedule, form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

**SUPPLEMENTAL BENEFITS**

Per hour:

Journeyworker:	07/01/2020
	\$ 30.50 up to 40 Hours
	After 40 hours \$ 21.35* PLUS \$ 1.15 on all hours worked

\*This amount is subject to premium

**OVERTIME PAY**

See (B, E, E2, P, \*R, \*\*U) on OVERTIME PAGE

**HOLIDAY**

Paid:..... See ( 5, 6, 8, 9, 15, 25 ) on HOLIDAY PAGE

Overtime..... See ( 5, 6, 8, 9, 15, 25 ) on OVERTIME PAGE

\* For Holiday codes 8,9,15,25 code R applies

\*\* For Holiday Codes 5 & 6 code U applies

Note: If employees are required to work on Easter Sunday they shall be paid at the rate of triple time.

**REGISTERED APPRENTICES**

(1)year terms at the following rate.

07/01/2020

1st term	\$ 27.48
2nd term	32.97
3rd term	38.47
4th term	43.96

Supplemental Benefits per hour:

\$ 22.50

8-137HH

**Operating Engineer - Heavy&Highway**

**07/01/2020**

**JOB DESCRIPTION** Operating Engineer - Heavy&Highway

**DISTRICT 9**

**ENTIRE COUNTIES**

Putnam, Westchester

**PARTIAL COUNTIES**

Dutchess: South of the North city line of Poughkeepsie

**WAGES**

Party Chief - One who directs a survey party

Instrument Man - One who runs the instrument and assists Party Chief

Rodman - One who holds the rod and in general, assists the Survey Crew

Categories cover GPS & Underground Surveying

Per Hour: 07/01/2020

Party Chief \$ 81.06

Instrument Man 61.32

Rodman 52.53

**SUPPLEMENTAL BENEFITS**

Per Hour: 07/01/2020

All Categories

Straight Time: \$ 23.10\* plus \$6.90

Premium:

Time & 1/2 \$ 34.65\* plus \$6.90

Double Time

\$ 46.20\* plus \$6.90

Non-Worked Holiday Supplemental Benefits:

\$ 16.45

**OVERTIME PAY**

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

\* Doubletime paid on all hours in excess of 8 hours on Saturday

**HOLIDAY**

Paid: See (5, 6, 7, 11, 12) on HOLIDAY PAGE

Overtime: See (5, 6, 7, 11, 12) on HOLIDAY PAGE

9-15Dh

**Operating Engineer - Heavy&Highway - Tunnel**

**07/01/2020**

**JOB DESCRIPTION** Operating Engineer - Heavy&Highway - Tunnel

**DISTRICT** 8

**ENTIRE COUNTIES**

Putnam, Westchester

**PARTIAL COUNTIES**

Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

**WAGES**

GROUP I: Boom Truck, Cherry Picker, Clamshell, Crane(Crawler,Truck), Dragline, Drill Rig Casa Grande(Cat or Similar), Floating Crane(Crane on Barge-Under 100 Tons), Hoist Engineer(Concrete/Crane-Derrick-Mine Hoist), Knuckle Boom Crane, Rough Terrain Crane.

GROUP I-A: Auger(Truck or Truck Mounted), Boat Captain, Bull Dozer-all sizes, Central Mix Plant Operator, Chipper-all types, Close Circuit T.V., Combination Loader/Backhoe, Compactor with Blade, Concrete Finishing Machine, Gradall, Grader(Motor Grader), Elevator & Cage(Materials or Passengers), Excavator(and all attachments), Front End Loaders(1 1/2 yards and over), High Lift Lull, Hoist(Single, Double, Triple Drum), Hoist Portable Mobile Unit, Hoist Engineer(Material), Jack and Bore Machine, Log Skidder, Milling Machine, Moveable Concrete Barrier Transfer & Transport Vehicle, Mucking Machines. Overhead Crane, Paver(Concrete), Post Pounder of any type, Push Cats, Road Reclaimer, Robot Hammer(Brokk or similar), Robotic Equipment(Scope of Engineer Schedule), Ross Carrier and similar machines, Scrapers(20 yards struck and over), Side Boom, Slip Form Machine, Spreader(Asphalt), Trenching Machines, Telephies-Vermeer Concrete Saw, Tractor type demolition equipment, Vacuum Truck.

GROUP I-B: Asphalt Mobile Conveyor/Transfer Machine, Road Paver(Asphalt).

GROUP II-A: Ballast Regulators, Compactor(Self-propelled), Fusion Machine, Rail Anchor Machines, Roller(4 ton and over), Scrapers(20 yard struck and under), Vibratory Roller(riding), Welder.

GROUP II-B: Mechanic(outside)all types.

GROUP III: Air Tractor Drill, Asphalt Plant, Batch Plant, Boiler(High Pressure), Concrete Breaker(Track or Rubber Tire), Concrete Pump, Concrete Spreader, Excavator Drill, Farm Tractor, Forklift(all types of power), Gas Tapping(Live), Hydroseeder, Loader(1 1/2 yards and under), Locomotive(all sizes), Machine Pulling Sheeps Foot Roller, Portable Asphalt Plant, Portable Batch Plant, Portable Crusher(Apprentice), Powerhouse Plant, Roller(under 4 ton), Sheer Excavator, Skidsteer/Bobcat, Stone Crusher, Sweeper(with seat), Well Drilling Machine.

GROUP IV-A: Service Person(Grease Truck).

GROUP IV-B: Conveyor Belt Machine(Truck Mounted), Heater(all types), Lighting Unit(Portable), Maintenance Engineer(for Crane only), Mechanics Helper, Pump(Fireproofing), Pumps-Pump Station/Water/Sewer/Gypsum/Plaster, etc., Pump Truck(Sewer Jet or similar), Welding Machine(Steel Erection), Welders Helper.

GROUP V-A: Engineer(all Tower Cranes, all Climbing Cranes & all Cranes of 100 ton capacity or greater),Hoist Engineer(Steel-Sub Structure), Engineer-Pile Driver, Jersey-Spreader, Pavement breaker, Post Hole Digger

WAGES: (per hour)

07/01/2020

GROUP I	\$ 62.38
GROUP I-A	54.95
GROUP I-B	57.92
GROUP II-A	52.61
GROUP II-B	54.26
GROUP III	51.68
GROUP IV-A	46.93
GROUP IV-B	40.24
GROUP V-A	
Engineer-Cranes	70.72
Engineer-Pile Driver	68.27
Hoist Engineer	64.00
Jersey Spreader	53.83
Pavement Breaker	53.83
Post Hole Digger	53.83

**SHIFT DIFFERENTIAL:**

A 15% premium on all hours paid, including overtime hours for 2nd, 3rd shifts on all government mandated off-shift work

An additional 20% to wage when required to wear protective equipment on hazardous/toxic waste projects. Operators required to use two buckets pouring concrete on other than road pavement shall receive \$0.50 per hour over scale. Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional \$2.00 per hour. Engineers operating cranes with booms 149 feet or over in length will be paid an additional \$3.00 per hour. Operators of shovels with a capacity over (4) cubic yards shall be paid an additional \$1.00 per hour. Operators of loaders with a capacity over (5) cubic yards shall be paid an additional \$0.50 per hour.

**SUPPLEMENTAL BENEFITS**

Per hour:

Journeyworker: 07/01/2020  
 \$ 22.50  
 + \$8.00  
 (Limited to  
 first 40 hours)

**OVERTIME PAY**

See (D, O, \*U, V) on OVERTIME PAGE

**HOLIDAY**

Paid: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE

\* Note: For Holiday codes 5 & 6, code U applies.

Note: If employees are required to work on Easter Sunday, they shall be paid at the rate of triple time.

**REGISTERED APPRENTICES**

(1)year terms at the following rates:

07/01/2020  
 1st term \$ 27.48  
 2nd term 32.97  
 3rd term 38.47  
 4th term 43.96

Supplemental Benefits per hour:

07/01/2020  
 All terms \$ 22.50

8-137Tun

**Operating Engineer - Marine Dredging**

**07/01/2020**

**JOB DESCRIPTION** Operating Engineer - Marine Dredging

**DISTRICT 4**

**ENTIRE COUNTIES**

Albany, Bronx, Cayuga, Chautauqua, Clinton, Columbia, Dutchess, Erie, Essex, Franklin, Greene, Jefferson, Kings, Monroe, Nassau, New York, Niagara, Orange, Orleans, 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:	07/01/2020	10/01/2020
CLASS A1 Deck Captain, Leverman Mechanical Dredge Operator Licensed Tug Operator 1000HP or more.	\$ 40.31	\$ 41.42
CLASS A2 Crane Operator (360 swing)	35.92	36.91
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,	34.86	35.82

Engineer, Chief Mate, Electrician,  
 Chief Welder, Maintenance Engineer  
 Licensed Boat, Crew Boat Operator

CLASS B2 Certified Welder	32.82	33.72
CLASS C1 Drag Barge Operator, Steward, Mate, Assistant Fill Placer	31.92	32.80
CLASS C2 Boat Operator	30.89	31.74
CLASS D Shoreman, Deckhand, Oiler, Rodman, Scowman, Cook, Messman, Porter/Janitor	25.66	26.37

**SUPPLEMENTAL BENEFITS**

Per Hour:  
 THE FOLLOWING SUPPLEMENTAL BENEFITS APPLY TO ALL CATEGORIES

All Classes A & B	07/01/2020 \$11.58 plus 7.5% of straight time wage, Overtime hours add \$ 0.63	10/01/2020 \$11.98 plus 8% of straight time wage, Overtime hours add \$ 0.63
All Class C	\$11.28 plus 7.5% of straight time wage, Overtime hours add \$ 0.48	11.68 plus 8% of straight time wage, Overtime hours add \$ 0.48
All Class D	\$10.98 plus 7.5% of straight time wage, Overtime hours add \$ 0.33	11.38 plus 8% of straight time wage, Overtime hours add \$ 0.33

**OVERTIME PAY**  
 See (B2, F, R) on OVERTIME PAGE

**HOLIDAY**  
 Paid: See (1) on HOLIDAY PAGE  
 Overtime: See (5, 6, 8, 15, 26) on HOLIDAY PAGE

4-25a-MarDredge

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**Operating Engineer - Survey Crew - Consulting Engineer** **07/01/2020**

**JOB DESCRIPTION** Operating Engineer - Survey Crew - Consulting Engineer **DISTRICT 9**

**ENTIRE COUNTIES**  
 Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

**PARTIAL COUNTIES**  
 Dutchess: That part in Dutchess County lying South of the North City line of Poughkeepsie.

**WAGES**  
 Feasibility and preliminary design surveying, any line and grade surveying for inspection or supervision of construction.

Per hour: 07/01/2020  
 Survey Classifications

Party Chief	\$ 45.32
Instrument Man	37.85
Rodman	33.14

**SUPPLEMENTAL BENEFITS**

Per Hour:

All Crew Members: \$ 19.50

**OVERTIME PAY**

OVERTIME:.... See ( B, E\*, Q, V ) ON OVERTIME PAGE.

\*Doubletime paid on the 9th hour on Saturday.

**HOLIDAY**

Paid: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

Overtime: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

9-15dconsult

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**Painter** **07/01/2020**

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**JOB DESCRIPTION** Painter

**DISTRICT 8**

**ENTIRE COUNTIES**

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

**WAGES**

Per hour: 07/01/2020

Brush \$ 49.20\*

Abatement/Removal of lead based  
 or lead containing paint on  
 materials to be repainted. 49.20\*

Spray & Scaffold \$ 52.20\*

Fire Escape 52.20\*

Decorator 52.20\*

Paperhanger/Wall Coverer 51.96\*

\*Subtract \$ 0.10 to calculate premium rate.

**SUPPLEMENTAL BENEFITS**

Per hour: 07/01/2020

Paperhanger \$ 30.70

All others 28.81

Premium 32.14\*\*

\*\*Applies only to "All others" category,not paperhanger journeyworker.

**OVERTIME PAY**

See (A, H) on OVERTIME PAGE

**HOLIDAY**

Paid: See (1) on HOLIDAY PAGE

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

**REGISTERED APPRENTICES**

One ( 1 ) year terms at the following wage rate.

Per hour: 07/01/2020

Appr 1st term... \$ 19.12\*

Appr 2nd term... 24.52\*

Appr 3rd term... 29.72\*

Appr 4th term... 39.75\*

\*Subtract \$ 0.10 to calculate premium rate.

Supplemental benefits:

Per Hour: 07/01/2020

Appr 1st term... \$ 14.32

Appr 2nd term... 17.78

Appr 3rd term... 20.40

Appr 4th term... 25.89

8-NYDC9-B/S

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**Painter** **07/01/2020**

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**JOB DESCRIPTION** Painter

**DISTRICT 8**

**ENTIRE COUNTIES**

Putnam, Suffolk, Westchester

**PARTIAL COUNTIES**

Nassau: All of Nassau except the areas described below: Atlantic Beach, Ceaderhurst, East Rockaway, Gibson, Hewlett, Hewlett Bay, Hewlett Neck, Hewlett Park, Inwood, Lawrence, Lido Beach, Long Beach, parts of Lynbrook, parts of Oceanside, parts of Valley Stream, and Woodmere. Starting on the South side of Sunrise Hwy in Valley Stream running east to Windsor and Rockaway Ave., Rockville Centre is the boundary line up to Lawson Blvd. turn right going west all the above territory. Starting at Union Turnpike and Lakeville Rd. going north to Northern Blvd. the west side of Lakeville road to Northern blvd. At Northern blvd. going east the district north of Northern blvd. to Port Washington Blvd. West of Port Washington blvd. to St. Francis Hospital then north of first traffic light to Port Washington and Sands Point, Manor HAven, Harbour Acres.

**WAGES**

Per hour: 07/01/2020  
 Drywall Taper \$ 49.20\*

\*Subtract \$ 0.10 to calculate premium rate.

**SUPPLEMENTAL BENEFITS**

Per hour: 07/01/2020  
 Journeyman \$ 28.81

**OVERTIME PAY**

See (A, H) on OVERTIME PAGE

**HOLIDAY**

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

**REGISTERED APPRENTICES**

Wages - Per Hour: 07/01/2020

1500 hour terms at the following wage rate:

1st term \$ 19.12\*  
 2nd term 24.52\*  
 3rd term 29.72\*  
 4th term 39.75\*

\*Subtract \$ 0.10 to calculate premium rate.

Supplemental Benefits - Per hour:

One year term (1500 hours) at the following dollar amount.

1st year \$ 14.32  
 2nd year 17.78  
 3rd year 20.40  
 4th year 25.89

8-NYDCT9-DWT

**Painter - Bridge & Structural Steel**

**07/01/2020**

**JOB DESCRIPTION** Painter - Bridge & Structural Steel

**DISTRICT 8**

**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:	07/01/2020	10/01/2020	10/01/2021
	\$ 50.25	\$ 51.50	\$ 53.00
	+ 7.88*	+ 8.63*	+ 9.63*

ADDITIONAL \$6.50 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 (no 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.

**SUPPLEMENTAL BENEFITS**

Per Hour:

Journeyworker:	07/01/2020	10/01/2020	10/01/2021
	\$ 10.20	\$ 10.90	\$ 10.90
	+ 29.65*	+ 30.00*	+ 30.60*

\* 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 (no cap).

**OVERTIME PAY**

See (A, F, R) on OVERTIME PAGE

**HOLIDAY**

Paid: See (1) on HOLIDAY PAGE  
 Overtime: See (4, 6) on HOLIDAY PAGE

**REGISTERED APPRENTICES**

Wage - Per hour:

Apprentices: (1) year terms

	07/01/2020	10/01/2020	10/01/2021
1st year	\$ 20.10	\$ 20.60	\$ 21.20
	+ 3.15*	+ 3.45*	+ 3.86*
2nd year	\$ 30.15	\$ 30.90	\$ 31.80
	+ 4.73*	+ 5.18*	+ 5.78*
3rd year	\$ 40.20	\$ 41.20	\$ 42.40
	+ 6.30*	+ 6.90*	+ 7.71*
Supplemental Benefits - Per hour:			
1st year	\$ 4.08	\$ 4.36	\$ 4.36
	+ 11.87*	+ 12.00*	+ 12.25*
2nd year	\$ 6.12	\$ 6.54	\$ 6.54
	+ 17.81*	+ 18.01*	+ 18.37*
3rd year	\$ 8.16	\$ 8.72	\$ 8.72
	+ 23.74*	+ 24.02*	+ 24.50*

8-DC-9/806/155-BrSS

**Painter - Line Striping** **07/01/2020**

**JOB DESCRIPTION** Painter - Line Striping

**DISTRICT 8**

**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:

Painter (Striping-Highway):	07/01/2020	07/01/2021	07/01/2022
Striping-Machine Operator*	\$ 30.10	\$ 30.32	\$ 31.53

Linerman Thermoplastic	\$ 36.53	\$ 36.93	\$ 38.34
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Note: \* Includes but is not limited to: Positioning of cones and directing of traffic using hand held devices. Excludes the Driver/Operator of equipment used in the maintenance and protection of traffic safety.

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day.

NOTE - In order to use the '4 Day/10 Hour Work Schedule,' as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

**SUPPLEMENTAL BENEFITS**

Per hour paid:	07/01/2020	07/01/2021	07/01/2022
Journeyworker:			
Striping Machine Operator:	\$ 9.16	\$ 10.03	\$ 10.03
Linerman Thermoplastic:	\$ 9.16	\$ 10.03	\$ 10.03

**OVERTIME PAY**

See (B, B2, E2, F, S) on OVERTIME PAGE

**HOLIDAY**

Paid: See (5, 20) on HOLIDAY PAGE  
 Overtime: See (5, 20) on HOLIDAY PAGE

**REGISTERED APPRENTICES**

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

	07/01/2020	07/01/2021	07/01/2022
1st Term:	\$ 12.04	\$ 12.12	\$ 12.61
2nd Term:	\$ 18.06	\$ 18.19	\$ 19.82
3rd Term:	\$ 24.08	\$ 24.26	\$ 25.22

Supplemental Benefits per hour:

1st term:	\$ 9.16	\$ 10.03	\$ 10.03
2nd Term:	\$ 9.16	\$ 10.03	\$ 10.03
3rd Term:	\$ 9.16	\$ 10.03	\$ 10.03

8-1456-LS

**Painter - Metal Polisher**

**07/01/2020**

**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

**WAGES**

	07/01/2020
Metal Polisher	\$ 36.33
Metal Polisher*	37.43
Metal Polisher**	40.33

\*Note: Applies on New Construction & complete renovation

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

**SUPPLEMENTAL BENEFITS**

Per Hour: 07/01/2020

Journeyworker:  
 All classification \$ 9.94

**OVERTIME PAY**

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

**HOLIDAY**

Paid: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

Overtime: See (5, 6, 9, 11, 15, 16, 25, 26) on HOLIDAY PAGE

**REGISTERED APPRENTICES**

Wages per hour:

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

	07/01/2020
1st year	\$ 16.00
2nd year	17.00
3rd year	18.00
1st year*	\$ 16.39
2nd year*	17.44
3rd year*	18.54
1st year**	\$ 18.50
2nd year**	19.50
3rd year**	20.50

\*Note: Applies on New Construction & complete renovation

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

Supplemental benefits:

Per hour:

1st year	\$ 6.69
2nd year	6.69
3rd year	6.69

8-8A/28A-MP

**Plumber**

**07/01/2020**

**JOB DESCRIPTION** Plumber

**DISTRICT 8**

**ENTIRE COUNTIES**

Putnam, Westchester

**WAGES**

Per hour:

07/01/2020

Plumber and Steamfitter	\$ 57.86
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**SHIFT WORK:**

When directly specified in public agency or authority contract documents, shift work outside the regular hours of work shall be comprised of eight (8) hours per shift not including Saturday, Sundays and holidays. One half (1/2) hour shall be allowed for lunch after the first four (4) hours of each shift. Wage and Fringes for shift work shall be straight time plus a shift premium of twenty-five (25%) percent. A minimum of five days Monday through Friday must be worked to establish shift work.

**SUPPLEMENTAL BENEFITS**

Per hour:

Journeyworker	\$ 37.56
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**OVERTIME PAY**

See (B, E, E2, Q, V) on OVERTIME PAGE

OVERTIME:... See on OVERTIME PAGE.

**HOLIDAY**

Paid: See (1) on HOLIDAY PAGE

Overtime: See (5, 6, 8, 16, 25) on HOLIDAY PAGE

**REGISTERED APPRENTICES**

(1)year terms at the following wages:

1st Term	\$ 21.44
2nd Term	24.62
3rd Term	28.42
4th Term	40.61
5th Term	43.58

Supplemental Benefits per hour:

1st term	\$ 15.59
2nd term	17.38
3rd term	20.69
4th term	27.20
5th term	28.82

8-21.1-ST

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**Plumber - HVAC / Service** **07/01/2020**

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**JOB DESCRIPTION** Plumber - HVAC / Service **DISTRICT 8**

**ENTIRE COUNTIES**  
 Dutchess, Putnam, Westchester

**PARTIAL COUNTIES**  
 Delaware: Only the townships of Middletown and Roxbury  
 Ulster: Entire County(including Wallkill and Shawangunk Prisons) except for remainder of Town of Shawangunk and Towns of Plattekill, Marlboro, and Wawarsing.

**WAGES**  
 Per hour: 07/01/2020

HVAC Service \$ 39.68  
 + \$ 4.32\*

\*Note: This portion of wage is not subject to overtime premium.

**SUPPLEMENTAL BENEFITS**  
 Per hour: 07/01/2020

Journeyworker HVAC Service  
 \$ 25.14

**OVERTIME PAY**  
 See (B, F, R) on OVERTIME PAGE

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

**REGISTERED APPRENTICES**  
 HVAC SERVICE

(1)year terms at the following wages:

07/01/2020				
1st yr.	2nd yr.	3rd yr.	4th yr.	5th yr.
\$ 18.05	\$ 21.33	\$ 26.66	\$ 32.76	\$ 35.46
+\$2.37*	+\$2.67*	+\$3.22*	+\$3.84*	+\$4.07*

\*Note: This portion of wage is not subject to overtime premium.

Supplemental Benefits per hour:

Apprentices 07/01/2020

1st term	\$ 19.03
2nd term	20.09
3rd term	21.30
4th term	22.90
5th term	24.07

8-21.1&2-SF/Re/AC

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**Plumber - Jobbing & Alterations** **07/01/2020**

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**JOB DESCRIPTION** Plumber - Jobbing & Alterations **DISTRICT 8**

**ENTIRE COUNTIES**  
 Dutchess, Putnam, Westchester

**PARTIAL COUNTIES**

Ulster: Entire county (including Wallkill and Shawangunk Prisons in Town of Shawangunk) EXCEPT for remainder of Town of Shawangunk, and Towns of Plattekill, Marlboro, and Wawarsing.

**WAGES**

Per hour: 07/01/2020  
Journeyworker: \$ 44.91

Repairs, replacements and alteration work is any repair or replacement of a present plumbing system that does not change existing roughing or water supply lines.

**SHIFT WORK:**

When directly specified in public agency or authority contract documents, shift work outside the regular hours of work shall be comprised of eight (8) hours per shift not including Saturday, Sundays and holidays. One half (1/2) hour shall be allowed for lunch after the first four (4) hours of each shift. Wage and Fringes for shift work shall be straight time plus a shift premium of twenty-five (25%) percent. A minimum of five days Monday through Friday must be worked to establish shift work.

**SUPPLEMENTAL BENEFITS**

Per hour:  
Journeyworker \$ 31.60

**OVERTIME PAY**

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

\*When used as a make-up day, hours after 8 on Saturday shall be paid at time and one half.

**HOLIDAY**

Paid: See (1) on HOLIDAY PAGE  
Overtime: See (5, 6, 8, 16, 25) on HOLIDAY PAGE

**REGISTERED APPRENTICES**

(1) year terms at the following wages:

1st year \$ 19.52  
2nd year 21.65  
3rd year 23.42  
4th year 32.92  
5th year 34.76

Supplemental Benefits per hour:

1st year \$ 10.21  
2nd year 12.05  
3rd year 15.88  
4th year 21.42  
5th year 23.29

8-21.3-J&A

**Roofer**

**07/01/2020**

**JOB DESCRIPTION** Roofer

**DISTRICT 9**

**ENTIRE COUNTIES**

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

**WAGES**

Per Hour: 07/01/2020

Roofer/Waterproofer \$ 44.25  
+ \$7.00\*

\* This portion is not subject to overtime premiums.

Note: Abatement/Removal of Asbestos containing roofs and roofing material is classified as Roofer.

**SUPPLEMENTAL BENEFITS**

Per Hour: \$ 27.87

**OVERTIME PAY**

See (B, H) on OVERTIME PAGE

Note: An observed holiday that falls on a Sunday will be observed the following Monday.

**HOLIDAY**

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

**REGISTERED APPRENTICES**

( 1 ) year term

	1st	2nd	3rd	4th
	\$ 15.49	\$ 22.13	\$ 26.55	\$ 33.19
		+ 3.00*	+ 4.20*	+ 5.26*

Supplements:

	1st	2nd	3rd	4th
	\$ 3.57	\$ 14.10	\$ 16.85	\$ 20.98

9-8R

**Sheetmetal Worker**

**07/01/2020**

**JOB DESCRIPTION** Sheetmetal Worker

**DISTRICT 8**

**ENTIRE COUNTIES**

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

**WAGES**

	07/01/2020
SheetMetal Worker	\$ 46.92

**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	\$ 42.55
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**OVERTIME PAY**

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

**HOLIDAY**

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
\$17.47	\$19.65	\$ 21.85	\$ 24.03	\$ 26.20	\$ 28.40	\$ 31.06	\$ 33.72

Supplemental Benefits per hour:

**Apprentices**

1st term	\$ 18.31
2nd term	20.60
3rd term	22.88
4th term	25.19
5th term	27.47
6th term	29.75
7th term	31.56
8th term	33.39

8-38

**Sheetmetal Worker**

**07/01/2020**

**JOB DESCRIPTION** Sheetmetal Worker

**DISTRICT 4**

**ENTIRE COUNTIES**

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

**WAGES**

Per Hour:	07/01/2020	8/01/2020
Sign Erector	\$ 50.79	Additional \$1.68/Hr.

NOTE: Structurally Supported Overhead Highway Signs(See STRUCTURAL IRON WORKER CLASS)

**SUPPLEMENTAL BENEFITS**

Per Hour:	07/01/2020	8/01/2020
Sign Erector	\$ 49.82	Additional \$1.26/Hr.

**OVERTIME PAY**

See (A, F, S) on OVERTIME PAGE

**HOLIDAY**

Paid: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE  
 Overtime: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE

**REGISTERED APPRENTICES**

Per Hour:  
 6 month Terms at the following percentage of Sign Erectors wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
35%	40%	45%	50%	55%	60%	65%	70%	75%	80%

**SUPPLEMENTAL BENEFITS**

Per Hour:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$13.96	\$15.81	\$17.68	\$19.56	\$27.26	\$29.65	\$32.80	\$35.26	\$37.71	\$40.15

"8/01/2020" Additional \$1.26/Hr.

4-137-SE

**Sprinkler Fitter** **07/01/2020**

**JOB DESCRIPTION** Sprinkler Fitter

**DISTRICT 1**

**ENTIRE COUNTIES**

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

**WAGES**

Per hour

07/01/2020

Sprinkler Fitter \$ 45.52

**SUPPLEMENTAL BENEFITS**

Per hour

Journey person \$ 27.57

**OVERTIME PAY**

See (B, E, Q) on OVERTIME PAGE

**HOLIDAY**

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

Note: When a holiday falls on Sunday, the following Monday shall be considered a holiday and all work performed on either day shall be at the double time rate. When a holiday falls on Saturday, the preceding Friday shall be considered a holiday and all work performed on either day shall be at the double time rate.

**REGISTERED APPRENTICES**

Wages per hour

One Half Year terms at the following percentage of journey person's wage.

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
45%	50%	55%	60%	65%	70%	75%	80%	85%	90%

Supplemental Benefits per hour

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
\$ 8.27	\$ 8.27	\$ 18.70	\$ 18.70	\$ 18.95	\$ 18.95	\$ 18.95	\$ 18.95	\$ 18.95	\$ 18.95

1-669.2

**Teamster - Building / Heavy&Highway** **07/01/2020**

**JOB DESCRIPTION** Teamster - Building / Heavy&Highway

**DISTRICT 8**

**ENTIRE COUNTIES**

Putnam, Westchester

**WAGES**

GROUP A: Straight Trucks (6-wheeler and 10-wheeler), A-frame, Winch, Dynamite Seeding, Mulching, Agitator, Water, Attenuator, Light Towers, Cement (all types), Suburban, Station Wagons, Cars, Pick Ups, any vehicle carrying materials of any kind.

GROUP AA: Tack Coat

GROUP B: Tractor & Trailers (all types).

GROUP BB: Tri-Axle, 14 Wheeler

- GROUP C: Low Boy (carrying equipment).
- GROUP D: Fuel Trucks, Tire Trucks.
- GROUP E: Off-road Equipment (over 40 tons): Athey Wagons, Belly Dumps, Articulated Dumps, Trailer Wagons.
- GROUP F: Off-road Equipment (over 40 tons) Euclid, DJB.
- GROUP G: Off-road Equipment (under 40 tons) Athey Wagons, Belly Articulated Dumps, Trailer Wagons.
- GROUP H: Off-road Equipment(under 40 tons), Euclid.
- GROUP HH: Off-road Equipment(under 40 tons) D.J.B.
- GROUP I: Off-road Equipment(under 40 tons) Darts.
- GROUP II: Off-road Equipment(under 40 tons) RXS.

WAGES:(per hour)

07/01/2020

GROUP A	\$ 42.47*
GROUP AA	45.27*
GROUP B	43.09*
GROUP BB	42.59*
GROUP C	45.22*
GROUP D	42.92*
GROUP E	43.47*
GROUP F	44.47*
GROUP G	43.22*
GROUP H	43.84*
GROUP HH	44.22*
GROUP I	43.97*
GROUP II	44.34*

\* To calculate premium wage, subtract \$ .20 from the hourly wage.

Note: Fuel truck operators on construction sites addit. \$5.00 per day.  
For work on hazardous/toxic waste site addit. 20% of hourly rate.

Shift Differential:NYS DOT or other Governmental Agency contracts shall receive a shift differential of Fifteen(15%)percent above the wage rate

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday.

NOTE - In order to use the '4 Day/10 Hour Work schedule', as your normal schedule, you must submit an 'Employer Registration for Use of 4 Day/10 Hour Work Schedule,' form PW30.1; and there must be a dispensation of hours in place on the project. If the PW30.1 is not submitted you may be liable for overtime payments for work over 8 hours per day.

**SUPPLEMENTAL BENEFITS**

Per hour:  
Journeyworker

First 40 hours	\$ 33.64
41st-45th hours	15.18
Over 45 hours	0.26

**OVERTIME PAY**

See (B, E, P, R) on OVERTIME PAGE

**HOLIDAY**

Paid: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE  
Overtime: See (5, 6, 8, 9, 15, 25) on HOLIDAY PAGE

8-456

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**Welder**

**07/01/2020**

**JOB DESCRIPTION** Welder

**DISTRICT 1**

**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

**WAGES**

Per hour 07/01/2020

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
- ( 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



**NYS DOL Bureau of Public Work Debarment List 07/28/2020**

**Article 8**

AGENCY	Fiscal Officer	FEIN	EMPLOYER NAME	EMPLOYER DBA NAME	ADDRESS	DEBARMENT START DATE	DEBARMENT END DATE
DOL	NYC	****9839	A.J.S. PROJECT MANAGEMENT, INC.		149 FIFTH AVENUE NEW YORK NY 10010	12/29/2016	12/29/2021
DOL	DOL	****3344	ACT INC		6409 LAND O LAKES BLVD LAND O LAKES FL 34638	11/10/2015	11/10/2020
DOL	DOL	****4018	ADIRONDACK BUILDING RESTORATION INC.		4156 WILSON ROAD EAST TABERG NY 13471	03/26/2019	03/26/2024
DOL	AG	****1812	ADVANCED BUILDERS & LAND DEVELOPMENT, INC.		400 OSER AVE #2300HAUPPAUGE NY 11788	09/11/2019	09/11/2024
DOL	DOL	****1687	ADVANCED SAFETY SPRINKLER INC		261 MILL ROAD P.O BOX 296EAST AURORA NY 14052	07/29/2015	07/29/2020
DOL	DOL	****1687	ADVANCED SAFETY SPRINKLER INC		261 MILL ROAD P.O BOX 296EAST AURORA NY 14052	05/29/2019	05/29/2024
DOL	NYC	****6775	ADVENTURE MASONRY CORP.		1535 RICHMOND AVENUE STATEN ISLAND NY 10314	12/13/2017	12/13/2022
DOL	NYC		AGOSTINHO TOME		405 BARRETTO ST BRONX NY 10474	05/31/2018	05/31/2023
DOL	DOL		AJ TORCHIA		10153 ROBERTS RD SAUQUOIT NY 13456	08/09/2016	08/09/2021
DOL	DOL	****3344	ALL CATASTROPHE CONSTRUCTION TEAM INC	ACT INC	6409 LAND O LAKES BLVD LAND O LAKES FL 34638	11/10/2015	11/10/2020
DOL	DOL		AMADEO J TORCHIA	TORCHIA'S HOME IMPROVEMENT	10153 ROBERTS RD SAUQUOIT NY 13456	08/09/2016	08/09/2021
DOL	NYC		AMJAD NAZIR		2366 61ST ST BROOKLYN NY 11204	12/15/2016	12/15/2021
DOL	DOL		ANGELO F COKER			12/04/2018	12/04/2023
DOL	NYC		ANISUL ISLAM		C/O RELIANCE GENERAL CONS 644 OCEAN PARKWAYBROOKLYN NY 11230	09/02/2015	09/02/2020
DOL	DOL		ANITA SALERNO		158 SOLAR ST SYRACUSE NY 13204	01/07/2019	01/07/2024
DOL	NYC		ANTHONY J SCLAFANI		149 FIFTH AVE NEW YORK NY 10010	12/29/2016	12/29/2021
DOL	DOL		ANTHONY PERGOLA		3 WEST MAIN ST/SUITE 208 ELMSFORD NY 10323	01/23/2017	01/23/2022
DOL	DOL		ANTONIO ESTIVEZ		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL	****3020	APCO CONTRACTING CORP		24 SOUTH MARYLAND AVENUE PORT WASHINGTON NY 11050	09/24/2012	09/02/2020
DOL	DOL		ARNOLD A. PAOLINI		1250 BROADWAY ST BUFFALO NY 14212	02/03/2020	02/03/2025
DOL	NYC		ARSHAD MEHMOOD		168-42 88TH AVENUE JAMAICA NY 11432	11/20/2019	11/20/2024
DOL	DOL		ARVINDER ATWAL		65 KENNETH PLACE NEW HYDE PARK NY 11040	07/19/2017	07/19/2022
DOL	NYC	****4779	ASTORIA GENERAL CONTRACTING CORP		35-34 31ST STREET LONG ISLAND CITY NY 11106	09/02/2015	09/02/2020
DOL	NYC	****7217	ASTRO COMMUNICATIONS OF NY CORP		79 ALEXANDER AVE- STE 36A BRONX NY 10454	10/30/2015	10/30/2020
DOL	NYC	****6683	ATLAS RESTORATION CORP.		35-12 19TH AVENUE ASTORIA NY 11105	08/02/2017	08/02/2022
DOL	NYC	****5532	ATWAL MECHANICALS, INC		65 KENNETH PLACE NEW HYDE PARK NY 11040	07/19/2017	07/19/2022
DOL	NYC	****2591	AVI 212 INC.		260 CROPEY AVENUE APT 11GBROOKLYN NY 11214	10/30/2018	10/30/2023
DOL	AG		AVTAR SINGH		116-24 127TH STREET SOUTH OZONE PARK NY 11420	12/22/2015	12/22/2020
DOL	AG		BALDEV SINGH		116-24 127TH STREET SOUTH OZONE PARK NY 11420	12/22/2015	12/22/2020
DOL	NYC		BALWINDER SINGH		421 HUDSON ST SUITE C5NEW YORK NY 10014	02/20/2019	02/20/2024
DOL	DOL		BARRY KINNEY		6409 LAND O LAKES BLVD LAND O LAKES FL 34638	11/10/2015	11/10/2020

**NYSDOL Bureau of Public Work Debarment List 07/28/2020**

**Article 8**

DOL	NYC	****3915	BEACON RESTORATION INC		SUITE B-8 782 PELHAM PARKWAY SOUTHBRONX NY 10462	04/21/2016	04/21/2021
DOL	NYC	****8416	BEAM CONSTRUCTION, INC.		50 MAIN ST WHITE PLAINS NY 10606	01/04/2019	01/04/2024
DOL	DOL		BIAGIO CANTISANI			06/12/2018	06/12/2023
DOL	DOL	****4512	BOB BRUNO EXCAVATING, INC		5 MORNINGSIDE DR AUBURN NY 13021	05/28/2019	05/28/2024
DOL	DOL		BOGDAN MARKOVSKI		370 W. PLEASANTVIEW AVE SUITE 2.329HACKENSACK NJ 07601	02/11/2019	02/11/2024
DOL	DOL	****8551	BRANDY'S MASONRY		216 WESTBROOK STREET P O BOX 304SAYRE PA 18840	08/09/2016	08/09/2021
DOL	DOL	****1449	BRRESTORATION NY INC		140 ARCADIA AVENUE OSWEGO NY 13126	09/12/2016	09/12/2021
DOL	DOL		BRUCE MORSEY		C/O KENT HOLLOW SIDING LL 29A BRIDGE STREETNEW MILFORD CT 06776	01/15/2016	01/15/2021
DOL	DOL		BRUCE P. NASH JR.		5841 BUTTERNUT ROAD EAST SYRACUSE NY 13057	09/12/2018	09/12/2023
DOL	DOL	****0225	C&D LAFACE CONSTRUCTION, INC.		8531 OSWEGO RD BALDWINVILLE NY 13027	02/03/2020	01/09/2023
DOL	DOL	****8809	C.B.E. CONTRACTING CORPORATION		310 MCGUINNESS BLVD GREENPOINT NY 11222	03/07/2017	03/07/2022
DOL	DOL	****9383	C.C. PAVING AND EXCAVATING, INC.		2610 SOUTH SALINA ST SUITE 12SYRACUSE NY 13205	12/04/2018	12/04/2023
DOL	NYC		CALVIN WALTERS		465 EAST THIRD ST MT. VERNON NY 10550	09/09/2019	09/09/2024
DOL	DOL		CANTISANI & ASSOCIATES LTD		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		CANTISANI HOLDING LLC			06/12/2018	06/12/2023
DOL	DOL		CARIBBEAN POOLS		C/O DOUGLAS L MALARKEY 64 VICTORIA DRIVEBINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	DOL		CARMEN RACHETTA		8531 OSWEGO RD BALDWINVILLE NY 13027	02/03/2020	02/03/2025
DOL	DOL		CARMENA RACHETTA		8531 OSWEGO ROAD BALDWINVILLE NY 13027	02/03/2020	01/09/2023
DOL	DOL	****3812	CARMODY "2" INC			06/12/2018	06/12/2023
DOL	DOL	****1143	CARMODY BUILDING CORP	CARMODY CONTRACTIN G AND CARMODY CONTRACTIN G CORP.	442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		CARMODY CONCRETE CORPORATION			06/12/2018	06/12/2023
DOL	DOL		CARMODY ENTERPRISES, LTD.		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		CARMODY INC		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL	****3812	CARMODY INDUSTRIES INC			06/12/2018	06/12/2023
DOL	DOL		CARMODY MAINTENANCE CORPORATION		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL		CARMODY MASONRY CORP		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL	****8809	CBE CONTRACTING CORP		142 EAST MARKET STREET LONG BEACH NY 11561	03/07/2017	03/07/2022
DOL	AG		CESAR J. AGUDELO		81-06 34TH AVENUE APT. 6EJACKSON HEIGHTS NY 11372	02/07/2018	02/07/2023
DOL	DOL	****7655	CHAMPION CONSTRUCTION SERVICES CORP		2131 SCHENECTADY AVENUE BROOKLYN NY 11234	11/18/2015	11/18/2020
DOL	DOL		CHARLES ZIMMER JR		216 WESTBROOK STREET P O BOX 304SAYRE PA 18840	08/09/2016	08/09/2021
DOL	DOL		CHRISTINE J HEARNE		C/O CJ-HEARNE CONSTRUCTIO 131 PONCE DE LEON AVE NEATLANTA GA 30308	12/01/2015	12/01/2020
DOL	DOL		CHRISTOPHER J MAINI		19 CAITLIN AVE JAMESTOWN NY 14701	09/17/2018	09/17/2023

**NYS DOL Bureau of Public Work Debarment List 07/28/2020**

**Article 8**

DOL	DOL		CHRISTOPHER PAPASTEFANOU A/K/A CHRIS PAPASTEFANOU		1445 COMMERCE AVE BRONX NY 10461	05/30/2019	05/30/2024
DOL	DOL	****0671	CJ-HEARNE CONSTRUCTION CO		SUITE 204 131 PONCE DE LEON AVENUE ATLANTA GA 30308	12/01/2015	12/01/2020
DOL	DOL	****1927	CONSTRUCTION PARTS WAREHOUSE, INC.	CPW	5841 BUTTERNUT ROAD EAST SYRACUSE NY 13057	09/12/2018	09/12/2023
DOL	NYC	****2164	CREATIVE TRUCKING INC		58-83 54TH STREET MASPETH NY 11378	02/26/2016	02/26/2021
DOL	DOL	****2524	CSI ELECTRICAL & MECHANICAL INC		42-32 235TH ST DOUGLSTON NY 11363	01/14/2019	01/14/2024
DOL	DOL	****7761	D L MALARKEY CONSTRUCTION		64 VICTORIA DRIVE BINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	DOL	****7888	D L MALARKEY CONSTRUCTION INC		64 VICTORIA DRIVE BINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	DOL	****5629	DAKA PLUMBING AND HEATING LLC		2561 ROUTE 55 POUGHQUAG NY 12570	02/19/2016	02/19/2021
DOL	NYC		DALJIT KAUR BOPARAI		185-06 56TH AVE FRESH MEADOW NY 11365	10/17/2017	10/17/2022
DOL	DOL		DANICA IVANOSKI		61 WILLETT ST. PASSAIC NJ 07503	10/26/2016	10/26/2021
DOL	DOL		DARIAN L COKER		2610 SOUTH SALINA ST SUITE 2C SYRACUSE NY 13205	12/04/2018	12/04/2023
DOL	DOL		DAVID MARTINEZ		C/O EMPIRE TILE INC 6 TREMONT COURTHUNTINGTON STATION NY 11746	03/08/2016	03/08/2021
DOL	NYC		DAVID WEINER		14 NEW DROP LANE 2ND FLOOR STATEN ISLAND NY 10306	11/14/2019	11/14/2024
DOL	DOL		DEBBIE STURDEVANT		29 MAPLEWOOD DRIVE BINGHAMTON NY 13901	02/21/2017	02/21/2022
DOL	AG		DEBRA MARTINEZ		31 BAY ST BROOKLYN NY 11231	03/28/2018	03/28/2023
DOL	DOL		DEDA GAZIVODAN		C/O DAKA PLUMBING AND H 2561 ROUTE 55 POUGHQUAG NY 12570	02/19/2016	02/19/2021
DOL	DOL		DELPHI PAINTING & DECORATING CO INC		1445 COMMERCE AVE BRONX NY 10461	05/30/2019	05/30/2024
DOL	DOL		DENNIS SCHWANDTNER		C/O YES SERVICE AND REPAIR 145 LODGE AVE HUNTINGTON STATION NY 11476	08/09/2016	08/09/2021
DOL	DOL		DF CONTRACTORS OF ROCHESTER, INC.		1835 DAANSEN RD. PALMYRA NY 14522	05/16/2017	05/16/2022
DOL	DOL		DF CONTRACTORS, INC.		1835 DAANSEN RD. PALMYRA NY 14522	05/16/2017	05/16/2022
DOL	NYC		DIMITRIOS KOUTSOUKOS		C/O ASTORIA GENERAL CONTR 35-34 31ST STREET LONG ISLAND CITY NY 11106	09/02/2015	09/02/2020
DOL	NYC		DIMITRIOS TSOUMAS		35-12 19TH AVENUE ASTORIA NY 11105	08/02/2017	08/02/2022
DOL	DOL		DOMENICO LAFACE		8531 OSWEGO RD BALDWINSVILLE NY 13027	02/03/2020	01/09/2023
DOL	DOL	****3242	DONALD R. FORSAY	DF LAWN SERVICE	1835 DAANSEN RD. PALMYRA NY 14522	05/16/2017	05/16/2022
DOL	DOL		DONALD R. FORSAY		1835 DAANSEN RD. PALMYRA NY 14522	05/16/2017	05/16/2022
DOL	DOL		DORIS SKODA		C/O APCO CONTRACTING CORP 24 SOUTH MARYLAND AVENUE PORT WASHINGTON NY 11050	09/24/2012	09/02/2020
DOL	NYC	****7404	DOSANJH CONSTRUCTION CORP		9439 212TH STREET QUEENS VILLAGE NY 11428	02/25/2016	02/25/2021
DOL	DOL		DOUGLAS L MALARKEY	MALARKEY CONSTRUCTION	64 VICTORIA DRIVE BINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	NYC		DUARTE LOPES		66-05 WOODHAVEN BLVD. STE 2 REGO PARK NY 11374	04/20/2017	04/20/2022
DOL	DOL		E C WEBB		6409 LAND O LAKES BLVD LAND O LAKES FL 34638	11/10/2015	11/10/2020
DOL	DOL	****5175	EAGLE MECHANICAL AND GENERAL CONSTRUCTION LLC		11371 RIDGE RD WOLCOTT NY 14590	02/03/2020	02/03/2025

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DOL	DOL		EARL L WILSON	WILSON BROTHER DRYWALL CONTRACTORS	36 ABERSOLD STREET ROCHESTER NY 14621	08/31/2015	08/31/2020
DOL	DOL		EAST COAST PAVING		2238 BAKER RD GILLET PA 16923	03/12/2018	03/12/2023
DOL	NYC	****4269	EAST PORT EXCAVATION & UTILITIES		601 PORTION RD RONKONKOMA NY 11779	11/18/2016	11/18/2021
DOL	DOL	****0780	EMES HEATING & PLUMBING CONTR		5 EMES LANE MONSEY NY 10952	01/20/2002	01/20/3002
DOL	DOL	****3270	EMPIRE TILE INC		6 TREMONT COURT HUNTINGTON STATION NY 11746	03/08/2016	03/08/2021
DOL	NYC	****5917	EPOCH ELECTRICAL, INC		97-18 50TH AVE CORONA NY 11368	04/19/2018	04/19/2024
DOL	DOL	****7403	F & B PAINTING CONTRACTING INC		2 PARKVIEW AVENUE HARRISON NY 10604	09/26/2016	09/26/2021
DOL	DOL		FAIGY LOWINGER		11 MOUNTAIN RD 28 VAN BUREN DRMONROE NY 10950	03/20/2019	03/20/2024
DOL	DOL		FAY MATTHEW		C/O CHAMPION CONSTRUCTION 2131 SCHENECTADY AVENUEBROOKLYN NY 11234	11/18/2015	11/18/2020
DOL	DOL		FAZIA GINA ALI-MOHAMMED	C/O CHAMPION CONSTRUCTION	2131 SCHENECTADY AVENUE BROOKLYN NY 11234	11/18/2015	11/18/2020
DOL	DOL		FRANK BENEDETTO		19 CATLIN AVE JAMESTOWN NY 14701	09/17/2018	09/17/2023
DOL	DOL		FRANK BENEDETTO		C/O F & B PAINTING CONTRA 2 PARKVIEW AVENUEHARRISON NY 10604	09/26/2016	09/26/2021
DOL	DOL	****4722	FRANK BENEDETTO AND CHRISTOPHER J MAINI	B & M CONCRETE	19 CAITLIN AVE JAMESTOWN NY 14701	09/17/2018	09/17/2023
DOL	NYC		FRANK MAINI		1766 FRONT ST YORKTOWN HEIGHTS NY 10598	01/17/2018	01/17/2023
DOL	NYC	****6616	G & G MECHANICAL ENTERPRISES, LLC.		1936 HEMPSTEAD TURNPIKE EAST MEDOW NY 11554	11/29/2019	11/29/2024
DOL	DOL		GABRIEL FRASSETTI			04/10/2019	04/10/2024
DOL	DOL		GALINDA ROTENBERG		C/O GMDV TRANS INC 67-48 182ND STREETFRESH MEADOWS NY 11365	06/24/2016	06/24/2021
DOL	DOL		GEOFF CORLETT		415 FLAGGER AVE #302STUART FL 34994	10/31/2018	10/31/2023
DOL	DA		GEORGE LUCEY		150 KINGS STREET BROOKLYN NY 11231	01/19/1998	01/19/2998
DOL	DOL		GIGI SCHNECKENBURGER		261 MILL RD EAST AURORA NY 14052	05/29/2019	05/29/2024
DOL	DOL		GIOVANNI LAFACE		8531 OSWEGO RD BALDWINSVILLE NY 13027	02/03/2020	01/09/2023
DOL	NYC	****3164	GLOBE GATES INC	GLOBAL OVERHEAD DOORS	405 BARRETTO ST BRONX NY 10474	05/31/2018	05/31/2023
DOL	DOL	****5674	GMDV TRANS INC		67-48 182ND STREET FRESH MEADOWS NY 11365	06/24/2016	06/24/2021
DOL	NYC		GREAT ESTATE CONSTRUCTION, INC.		327 STAGG ST BROOKLYN NY 11206	10/10/2017	10/10/2022
DOL	DOL		GREGORY S. OLSON		P.O BOX 100 200 LATTA BROOK PARKHORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL		HANS RATH		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	NYC		HARMEL SINGH		15 CLINTON LANE HICKSVILLE NY 11801	02/25/2016	02/25/2021
DOL	NYC		HAROLD KUEMMEL		58-83 54TH STREET MASPETH NY 11378	02/26/2016	02/26/2021
DOL	NYC	****3228	HEIGHTS ELEVATOR CORP.		1766 FRONT ST YORKTOWN HEIGHTS NY 10598	01/17/2018	01/17/2023
DOL	DOL		HENRY VAN DALRYMPLE		2663 LANTERN LANE ATLANTA GA 30349	12/01/2015	12/01/2020
DOL	DOL	****8282	IDEMA DEVELOPMENT INC		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020

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DOL	DOL	****8282	IDEMA GENERAL CONTRACTORS INC		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020
DOL	DOL	****7001	INTEGRATED CONSTRUCTION & POWER SYSTEMS INC		SUITE 100 2105 W GENESEE STREETS YRACUSE NY 13219	01/06/2016	01/06/2021
DOL	DOL	****5131	INTEGRITY MASONRY, INC.	M&R CONCRETE	722 8TH AVE WATERVLIET NY 12189	06/05/2018	06/05/2023
DOL	DOL		IRENE KASELIS		32 PENNINGTON AVE WALDWICK NJ 07463	05/30/2019	05/30/2024
DOL	AG		J A M CONSTRUCTION CORP		SUITE 125 265 SUNRISE HIGHWAY ROCKVILLE CENTRE NY 10457	04/07/2016	04/07/2021
DOL	DOL		J.A. HIRES CADWALLADER		P.O BOX 100 200 LATTA BROOK PARKHORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL		JAMES B RHYNDERS		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020
DOL	DOL		JAMES C. DELGIACCO		722 8TH AVE WATERVLIET NY 12189	06/05/2018	06/05/2023
DOL	DOL		JAMES E RHYNDERS		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020
DOL	AG		JAMES FALCONE		SUITE 125 265 SUNRISE HIGHWAY ROCKVILLE CENTRE NY 10457	04/07/2016	04/07/2021
DOL	DOL		JAMES LIACONE		9365 WASHINGTON ST LOCKPORT IL 60441	07/23/2018	07/23/2023
DOL	DOL		JAMES RACHEL		9365 WASHINGTON ST LOCKPORT IL 60441	07/23/2018	07/23/2023
DOL	DOL		JAMES RHYNDERS SR		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020
DOL	DOL		JASON W MILLIMAN		C/O ROCHESTER ACOUSTICAL P O BOX 799 HILTON NY 14468	02/19/2016	02/19/2021
DOL	DOL	****5368	JCH MASONRY & LANDSCAPING INC.		35 CLINTON AVE OSSINING NY 10562	09/12/2018	09/12/2023
DOL	NYC		JENNIFER GUERRERO		1936 HEMPSTEAD TURNPIKE EAST MEADOW NY 11554	11/29/2019	11/29/2024
DOL	DOL		JESSICA WHITESIDE		C/O BRRESTORATION NY INC 140 ARCADIA AVENUE OSWEGO NY 13126	09/12/2016	09/12/2021
DOL	AG		JOHN ANTHONY MASSINO		36-49 204TH STREET BAYSIDE NY 11372	02/07/2018	02/07/2023
DOL	DOL		JOHN F. CADWALLADER		200 LATTA BROOK PARK HORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL	****4612	JOHN F. CADWALLADER, INC.	THE GLASS COMPANY	P.O BOX 100 200 LATTA BROOK PARKHORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL		JOHN GOCEK		14B COMMERCIAL AVE ALBANY NY 12065	11/14/2019	11/14/2024
DOL	AG	****0600	JOHNCO CONTRACTING, INC.		36-49 204TH STREET BAYSIDE NY 11372	02/07/2018	02/07/2023
DOL	DOL		JON E DEYOUNG		261 MILL RD P.O BOX 296 EAST AURORA NY 14052	07/29/2015	07/29/2020
DOL	DOL		JON E DEYOUNG		261 MILL RD P.O BOX 296 EAST AURORA NY 14052	05/29/2019	05/29/2024
DOL	DOL		JORI PEDERSEN		415 FLAGER AVE #302 STUART FL 34994	10/31/2018	10/31/2023
DOL	DOL		JOSE CHUCHUCA		35 CLINTON AVE OSSINING NY 10562	09/12/2018	09/12/2023
DOL	AG		JOSEPH FALCONE		SUITE 125 265 SUNRISE HIGHWAY ROCKVILLE CENTRE NY 10457	04/07/2016	04/07/2021
DOL	NYC		JOSEPH FOLEY		66-05 WOODHAVEN BLVD. STE 2 REGO PARK NY 11374	04/20/2017	04/20/2022
DOL	DOL	****9273	JOSEPH M LOVETRO		P O BOX 812 BUFFALO NY 14220	08/09/2016	08/09/2021
DOL	NYC		JOSEPH MARTINO		1535 RICHMOND AVENUE STATEN ISLAND NY 10314	12/13/2017	12/13/2022
DOL	DOL		JOY MARTIN		2404 DELAWARE AVE NIGARA FALLS NY 14305	09/12/2018	09/12/2023
DOL	DOL		JULIUS AND GITA BEHREND		5 EMES LANE MONSEY NY 10952	11/20/2002	11/20/3002

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DOL	DOL	****5062	K R F SITE DEVELOPMENT INC		375 LAKE SHORE DRIVE PUTNAM VALLEY NY 10579	01/23/2017	01/23/2022
DOL	NYC		K.S. CONTRACTING CORP.		29 PHILLIP DRIVE PARSIPPANY NJ 07054	02/13/2017	02/13/2022
DOL	DOL		KATIE BURDICK		2238 BAKER RD GILLET PA 16923	03/12/2018	03/12/2023
DOL	DOL		KENNETH FIORENTINO		375 LAKE SHORE DRIVE PUTNAM VALLEY NY 10579	01/23/2017	01/23/2022
DOL	DOL	****9732	KENT HOLLOW SIDING LLC		29A BRIDGE STREET NEW MILFORD CT 06776	01/15/2016	01/15/2021
DOL	DOL		KIM SOROCENSKI		C/O SOLUTION MATTERS INC 198 NORWOOD ROADPORT JEFFERSON NY 11776	11/19/2015	11/19/2020
DOL	DOL	****3490	L & M CONSTRUCTION/DRYWALL INC.		1079 YONKERS AVE YONKERS NY 10704	08/07/2018	08/07/2023
DOL	DA	****8816	LAKE CONSTRUCTION AND DEVELOPMENT CORPORATION		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	AG	****4643	LALO DRYWALL, INC.		221 OLD FORD ROAD NEW PLATZ NY 12561	05/20/2016	05/20/2021
DOL	DOL	****4505	LARAPINTA ASSOCIATES INC		29 MAPLEWOOD DRIVE BINGHAMTON NY 13901	02/21/2017	02/21/2022
DOL	DOL		LAVERN GLAVE		161 ROBYN RD MONROE NY 10950	01/30/2018	01/30/2023
DOL	DOL	****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	06/24/2016	09/19/2022
DOL	DOL	****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	06/24/2016	09/19/2022
DOL	DOL	****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL	****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL	****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	01/17/2017	09/19/2022
DOL	DOL	****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL	****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL	****4388	LEN.J CONSTRUCTION, LLC		PO BOX 10007 ALBANY NY 12201	08/14/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	09/19/2017	09/19/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	08/14/2017	08/14/2022
DOL	DOL		LEROY NELSON JR		PO BOX 10007 ALBANY NY 12201	01/17/2017	09/19/2022
DOL	DA	****4460	LONG ISLAND GLASS & STOREFRONTS, LLC		4 MANHASSET TRL RIDGE NY 11961	09/06/2018	09/06/2023
DOL	AG	****4216	LOTUS-C CORP.		81-06 34TH AVENUE APT. 6EJACKSON HEIGHTS NY 11372	02/07/2018	02/07/2023
DOL	NYC		LUBOMIR PETER SVOBODA		27 HOUSMAN AVE STATEN ISLAND NY 10303	12/26/2019	12/26/2024
DOL	AG		LUIS MARTINEZ	LALO DRYWALL	211 MAIN ST. NEW PALTZ NY 12561	05/20/2016	05/20/2021
DOL	NYC		M & L STEEL & ORNAMENTAL IRON CORP.		27 HOUSMAN AVE STATEN ISLAND NY 10303	12/26/2019	12/26/2024
DOL	DOL		M ANVER BEIG		142 EAST MARKET STREET LONG BEACH NY 11561	03/07/2017	03/07/2022
DOL	AG	****6957	M B DIN CONSTRUCTION INC		8831 20TH AVENUE/SUITE 6E BROOKLYN NY 11214	11/17/2015	11/17/2020
DOL	DOL		M. ANVER BEIG		142 EAST MARKET STREET LONG BEACH NY 11561	03/07/2017	03/07/2022
DOL	NYC	****9590	MACK GLASSNAUTH IRON WORKS INC		137 LIBERTY AVENUE BROOKLYN NY 11212	12/21/2015	12/21/2020
DOL	DOL	****1784	MADISON AVE CONSTRUCTION CORP		39 PENNY STREET WEST ISLIP NY 11795	11/02/2016	11/02/2021

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DOL	DOL		MALARKEY'S BAR & GRILL LLC		64 VICTORIA DRIVE BINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	DOL	****0705	MALARKEY'S PUB & GRUB LLC		64 VICTORIA DRIVE BINGHAMTON NY 13904	02/04/2016	02/04/2021
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	NYC		MAREK FABIJANOWSKI		50 MAIN ST WHITE PLAINS NY 10606	01/04/2019	01/04/2024
DOL	DOL		MARIACHI'S PIZZERIA		C/O DOUGLAS L MALARKEY 64 VICTORIA DRIVE BINGHAMTON NY 13904	02/04/2016	02/04/2021
DOL	DOL		MARK MIONIS		6409 LAND O LAKES BLVD LAND O LAKES FL 34638	11/10/2015	11/10/2020
DOL	NYC		MARTINE ALTER		1010 NORTHERN BLVD. GREAT NECK NY 11021	03/09/2017	03/09/2022
DOL	DOL		MARVIN A STURDEVANT		29 MAPLEWOOD DRIVE BINGHAMTON NY 13901	02/21/2017	02/21/2022
DOL	DOL		MASONRY CONSTRUCTION, INC.		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL	****3333	MASONRY INDUSTRIES, INC.		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	NYC		MATINA KARAGIANNIS		97-18 50TH AVE CORONA NY 11368	04/19/2018	04/19/2023
DOL	DOL		MATTHEW IDEMA GENERAL CONTRACTORS INC		91 COLLEGE AVENUE POUGHKEEPSIE NY 12603	12/04/2015	12/04/2020
DOL	DOL		MATTHEW P. KILGORE		4156 WILSON ROAD EAST TABERG NY 13471	03/26/2019	03/26/2024
DOL	DOL		MAURICE GAWENO		442 ARMONK RD MOUNT KISCO NY 10549	06/12/2018	06/12/2023
DOL	DOL	****6416	MCCALL MASONRY		P O BOX 304 SAYRE PA 18840	08/09/2016	08/09/2021
DOL	DOL		MCLEAN "MIKKI BEANE"		1229 JAMES STREET SYRACUSE NY 13203	05/02/2017	05/02/2022
DOL	DOL		MCLEAN "MIKKI" DRAKE		1229 JAMES STREET SYRACUSE NY 13203	05/02/2017	05/02/2022
DOL	DOL		MCLEAN M DRAKE-BEANE		1229 JAMES STREET SYRACUSE NY 13203	05/02/2017	05/02/2022
DOL	DOL	****9445	MCLEAN M WALSH	ELITE PROFESSIONAL PAINTING OF CNY	1229 JAMES STREET SYRACUSE NY 13203	05/02/2017	05/02/2022
DOL	DOL	****9445	MCLEAN M WALSH	ELITE PROFESSIONAL PAINTING OF CNY	1229 JAMES STREET SYRACUSE NY 13203	05/02/2017	05/02/2022
DOL	NYC	****5330	METRO DUCT SYSTEMS INC		1219 ASTORIA BOULEVARD LONG ISLAND CITY NY 11102	04/16/2014	11/19/2020
DOL	DOL		MICHAEL A PASCARELLA		SUITE 100 2105 WEST GENESEE STREET SYRACUSE NY 13219	01/06/2016	01/06/2021
DOL	NYC		MICHAEL HIRSCH		C/O MZM CORP 163 S MAIN STREET NEW CITY NY 10956	01/28/2016	01/28/2021
DOL	DOL		MICHAEL LENIHAN		1079 YONKERS AVE UNIT 4 YONKERS NY 10704	08/07/2018	08/07/2023
DOL	AG		MICHAEL RIGLIETTI		31 BAY ST BROOKLYN NY 11231	03/28/2018	03/28/2023
DOL	DOL		MICHAEL WILSON	WILSON BROTHER DRYWALL CONTRACTORS	36 ABERSOLD STREET ROCHESTER NY 14621	08/31/2015	08/31/2020
DOL	DOL	****4829	MILESTONE ENVIRONMENTAL CORPORATION		704 GINESI DRIVE SUITE 29 MORGANVILLE NJ 07751	04/10/2019	04/10/2024
DOL	NYC	****9926	MILLENNIUM FIRE PROTECTION, LLC		325 W. 38TH STREET SUITE 204 NEW YORK NY 10018	11/14/2019	11/14/2024
DOL	NYC	****0627	MILLENNIUM FIRE SERVICES, LLC		14 NEW DROP LNE 2ND FLOOR STATEN ISLAND NY 10306	11/14/2019	11/14/2024
DOL	AG		MOHAMMED N CHATHA		8831 20TH AVENUE/SUITE 6E BROOKLYN NY 11214	11/17/2015	11/17/2020
DOL	DOL	****2737	MOUNTAIN'S AIR INC		2471 OCEAN AVENUE- STE 7A BROOKLYN NY 11229	09/24/2012	09/18/2020

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DOL	NYC	****3826	MOVING MAVEN OF NY, INC.		1010 NORTHERN BLVD. GREAT NECK NY 11021	03/09/2017	03/09/2022
DOL	NYC	****3550	MOVING MAVEN, INC		1010 NORTHERN BLVD. GREAT NECK NY 11021	03/09/2017	03/09/2022
DOL	AG		MSR ELECTRICAL CONSTRUCTION CORP.		31 BAY ST BROOKLYN NY 11231	03/28/2018	03/28/2023
DOL	DOL		MUHAMMAD BEIG		142 EAST MARKET STREET LONG BEACH NY 11561	03/07/2017	03/07/2022
DOL	DOL		MUHAMMAD BEIG		142 EAST MARKET STREET LONG BEACH NY 11561	03/07/2017	03/07/2022
DOL	DOL		MUHAMMAD PERVAIZ		C/O CHAMPION CONSTRUCTION 2131 SCHENECTADY AVENUE BROOKLYN NY 11234	11/18/2015	11/18/2020
DOL	NYC	****3613	MZM CORP		163 S MAIN STREET NEW CITY NY 10956	01/28/2016	01/28/2021
DOL	DA	****9786	NATIONAL INSULATION & GC CORP		180 MILLER PLACE HICKSVILLE NY 11801	12/12/2018	12/12/2023
DOL	NYC	****4839	NEW YORK RIGGING CORP		58-83 54TH STREET MASPETH NY 11378	02/26/2016	02/26/2021
DOL	NYC		NICHOLAS FILIPAKIS		7113 FORT HAMILTON PARKWA BROOKLYN NY 11228	12/09/2016	12/09/2021
DOL	DOL	****6966	NORTH COUNTRY DRYWALL AND PAINT		23167 COUNTY ROUTE 59 DEXTER NY 13634	10/24/2016	10/24/2021
DOL	DOL	****0065	NORTHEAST LANDSCAPE AND MASONRY ASSOC		3 WEST MAIN ST/SUITE 208 ELMSFORD NY 10523	01/23/2017	01/23/2022
DOL	DOL	****1845	OC ERECTERS, LLC A/K/A OC ERECTERS OF NY INC.		1207 SW 48TH TERRACE DEERFIELD BEACH FL 33442	01/16/2018	01/16/2023
DOL	NYC	****0818	ONE TEN RESTORATION, INC.		2366 61ST ST BROOKLYN NY 11204	12/15/2016	12/15/2021
DOL	NYC		ORSON ARROYO		C/O METRO DUCT SYSTEMS 12-19 ASTORIA BOULEVARD LONG ISLAND CITY NY 11102	04/16/2014	11/19/2020
DOL	NYC		PARESH SHAH		29 PHILLIP DRIVE PARSIPPANY NJ 07054	02/13/2017	02/13/2022
DOL	NYC	****9422	PELIUM CONSTRUCTION, INC.		22-33 35TH ST. ASTORIA NY 11105	12/30/2016	12/30/2021
DOL	DOL		PETER M PERGOLA		3 WEST MAIN ST/SUITE 208 ELMSFORD NY 10523	01/23/2017	01/23/2022
DOL	DOL		PIERRE LAPORT		224 COUNTY HIGHWAY 138 BROADALBIN NY 12025	03/07/2017	03/07/2022
DOL	DOL	****1543	PJ LAPORT FLOORING INC		224 COUNTY HIGHWAY 138 BROADALBIN NY 12025	03/07/2017	03/07/2022
DOL	NYC	****5771	PMJ ELECTRICAL CORP		7113 FORT HAMILTON PARKWA BROOKLYN NY 11228	12/09/2016	12/09/2021
DOL	DOL	****0466	PRECISION BUILT FENCES, INC.		1617 MAIN ST PEEKSKILL NY 10566	03/03/2020	03/03/2025
DOL	NYC	****4532	PROFESSIONAL PAVERS CORP.		66-05 WOODHAVEN BLVD. REGO PARK NY 11374	04/20/2017	04/20/2022
DOL	DA	****6817	QUADRANT METAL BUILDINGS LLC		2740 SW MARTIN DOWNS BLVD PALM CITY FL 34990	08/25/2016	08/25/2021
DOL	NYC		RAMESHWAR ASU		137 LIBERTY AVENUE BROOKLYN NY 11212	12/21/2015	12/21/2020
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	01/30/2018	01/30/2023
DOL	AG	****7015	RCM PAINTING INC.		69-06 GRAND AVENUE 2ND FLOOR MASPETH NY 11378	02/07/2018	02/07/2023
DOL	DOL		REGINALD WARREN		161 ROBYN RD MONROE NY 10950	01/30/2018	01/30/2023
DOL	NYC	****3461	RELIANCE GENERAL CONSTRUCTION INC		644 OCEAN PARKWAY BROOKLYN NY 11230	09/02/2015	09/02/2020
DOL	DA		RIANN MULLER		2740 SW MARTIN DOWNS BLVD PALM CITY FL 34990	08/25/2016	08/25/2021
DOL	DOL	****9148	RICH T CONSTRUCTION		107 WILLOW WOOD LANE CAMILLUS NY 13031	11/13/2018	11/13/2023
DOL	DOL		RICHARD MACONE		8617 THIRD AVE BROOKLYN NY 11209	09/17/2018	09/17/2023

**NYSDOL Bureau of Public Work Debarment List 07/28/2020**

**Article 8**

DOL	DOL		RICHARD REGGIO		1617 MAIN ST PEEKSKILL NY 10566	03/03/2020	03/03/2025
DOL	DOL	****9148	RICHARD TIMIAN	RICH T CONSTRUCTI ON	108 LAMONT AVE SYRACUSE NY 13209	10/16/2018	10/16/2023
DOL	DOL		RICHARD TIMIAN JR.		108 LAMONT AVE SYRACUSE NY 13209	10/16/2018	10/16/2023
DOL	DOL		RICHARD TIMIAN JR.		108 LAMONT AVE SYRACUSE NY 13209	11/13/2018	11/13/2023
DOL	DOL		ROBBYE BISSEsar		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	01/11/2003	01/11/3003
DOL	DOL		ROBERT A. VALERINO		3841 LANYARD COURT NEW PORT RICHEY FL 34652	07/09/2019	07/09/2024
DOL	DOL		ROBERT BRUNO		3 GAYLORD ST AUBURN NY 13021	11/15/2016	11/15/2021
DOL	DOL		ROBERT BRUNO		5 MORNINGSIDE DRIVE AUBURN NY 13021	05/28/2019	05/28/2024
DOL	NYC		ROBERT HOHMAN		149 FIFTH AVE NEW YORK NY 10010	12/29/2016	12/29/2021
DOL	DOL	****3859	ROCHESTER ACOUSTICAL CORP		P O BOX 799 HILTON NY 14468	02/19/2016	02/19/2021
DOL	DOL		RODERICK PUGH		404 OAK ST SUITE 101SYRACUSE NY 13203	07/23/2018	07/23/2023
DOL	DOL	****4880	RODERICK PUGH CONSTRUCTION INC.		404 OAK ST SUITE 101SYRACUSE NY 13203	07/23/2018	07/23/2023
DOL	NYC		RODNEY SCOTT		201 HEMPSTEAD AVE WEST HEMPSTEAD NY 11552	10/30/2015	10/30/2020
DOL	DOL		ROMEO WARREN		161 ROBYN RD MONROE NY 10950	01/30/2018	01/30/2023
DOL	DOL		RONALD MESSEN		14B COMMERCIAL AVE ALBANY NY 12065	11/14/2019	11/14/2024
DOL	DOL		ROSEANNE CANTISANI			06/12/2018	06/12/2023
DOL	DOL		RYAN ALBIE		21 S HOWELLS POINT ROAD BELLPORT NY 11713	02/21/2017	02/21/2022
DOL	DOL	****3347	RYAN ALBIE CONTRACTING INC		21 S HOWELLS POINT ROAD BELLPORT NY 11713	02/21/2017	02/21/2022
DOL	DOL	****1365	S & L PAINTING, INC.		11 MOUNTAIN ROAD P.O BOX 408MONROE NY 10950	03/20/2019	03/20/2024
DOL	DOL	****7730	S C MARTIN GROUP INC.		2404 DELAWARE AVE NIAGARA FALLS NY 14305	09/12/2018	09/12/2023
DOL	NYC		SABIR MUHAMMED		SUITE B-8 782 PELHAM PARKWAY SOUTHBRONX NY 10462	04/21/2016	04/21/2021
DOL	DOL		SALVATORE A FRESINA			08/26/2016	08/26/2021
DOL	DOL		SAM FRESINA			08/26/2016	08/26/2021
DOL	NYC	****0349	SAM WATERPROOFING INC		168-42 88TH AVENUE APT.1 AJAMAICA NY 11432	11/20/2019	11/20/2024
DOL	NYC		SANDEEP BOPARAI		185-06 56TH AVE FRESH MEADOW NY 11365	10/17/2017	10/17/2022
DOL	NYC	****2117	SCOTT ELECTRICAL SERVICE, LLC.		201 HEMPSTEAD AVE WEST HEMPSTEAD NY 11552	10/30/2015	10/30/2020
DOL	DOL	****9751	SCW CONSTRUCTION		544 OLD ROUTE 23 ACRE NY 12405	02/14/2017	02/14/2022
DOL	AG		SERGIO RAYMUNDO		109 DUBOIS RD. NEW PALTZ NY 12561	05/20/2016	05/20/2021
DOL	NYC	****6597	SHAIRA CONSTRUCTION CORP.		421 HUDSON STREET SUITE C5NEW YORK NY 10014	02/20/2019	02/20/2024
DOL	DOL	****1961	SHANE BURDICK	CENTRAL TRAFFIC CONTROL, LLC.	2238 BAKER ROAD GILLET PA 16923	03/12/2018	03/12/2023
DOL	DOL		SHANE BURDICK		2238 BAKER ROAD GILLET PA 16923	03/12/2018	03/12/2023
DOL	DOL		SHANE NOLAN		9365 WASHINGTON ST LOCKPORT IL 60441	07/23/2018	07/23/2023
DOL	DOL		SHULEM LOWINGER		11 MOUNTAIN ROAD 28 VAN BUREN DRMONROE NY 10950	03/20/2019	03/20/2024
DOL	DOL	****0816	SOLAR ARRAY SOLUTIONS, LLC		9365 WASHINGTON ST LOCKPORT IL 60441	07/23/2018	07/23/2023

**NYS DOL Bureau of Public Work Debarment List 07/28/2020**

**Article 8**

DOL	DOL	****4025	SOLUTION MATTERS INC		198 NORWOOD ROAD PORT JEFFERSON NY 11776	11/19/2015	11/19/2020
DOL	DOL	****2221	SOUTH BUFFALO ELECTRIC, INC.		1250 BROADWAY ST BUFFALO NY 14212	02/03/2020	02/03/2025
DOL	DOL	****3496	STAR INTERNATIONAL INC		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	08/11/2003	08/11/3003
DOL	DOL	****6844	STEAM PLANT AND CHX SYSTEMS INC.		14B COMMERCIAL AVENUE ALBANY NY 12065	11/14/2019	11/14/2024
DOL	DOL	****9933	STEED GENERAL CONTRACTORS, INC.		1445 COMMERCE AVE BRONX NY 10461	05/30/2019	05/30/2024
DOL	DOL		STEFANOS PAPASTEFANOU, JR. A/K/A STEVE PAPASTEFANOU, JR.		256 WEST SADDLE RIVER RD UPPER SADDLE RIVER NJ 07458	05/30/2019	05/30/2024
DOL	DOL	****9751	STEPHEN C WAGAR		544 OLD ROUTE 23 ACRE NY 12405	02/14/2017	02/14/2022
DOL	DOL		STEVE TATE		415 FLAGER AVE #302STUART FL 34994	10/31/2018	10/31/2023
DOL	NYC		STEVEN GOVERNALE		601 PORTION RD RONKONKOMA NY 11779	11/18/2016	11/18/2021
DOL	DOL		STEVEN MARTIN		2404 DELWARE AVE NIAGARA FALLS NY 14305	09/12/2018	09/12/2023
DOL	DOL		STEVEN P SUCATO		15-68 208TH STREET BAYSIDE NY 11360	06/23/2016	06/23/2021
DOL	DOL		STEVEN TESTA		50 SALEM STREET - BLDG B LYNNFIELD MA 01940	01/23/2017	01/23/2022
DOL	NYC	****9432	SUBLINK LTD		346 THIRD AVENUE PELHAM NY 10803	11/19/2015	11/19/2020
DOL	NYC	****5863	SUKHMANY CONSTRUCTION, INC.		185-06 56TH AVE FRESH MEADOW NY 11365	10/17/2017	10/17/2022
DOL	DOL	****1060	SUNN ENTERPRISES GROUP, LLC		370 W. PLEASANTVIEW AVE SUITE 2.329HACKENSACK NJ 07601	02/11/2019	02/11/2024
DOL	DOL	****8209	SYRACUSE SCALES, INC.		158 SOLAR ST SYRACUSE NY 13204	01/07/2019	01/07/2024
DOL	DOL		TALAILA OCAMPA		1207 SW 48TH TERRACE DEERFIELD BEACH FL 33442	01/16/2018	01/16/2023
DOL	DOL	****9852	TAP STEEL INC		ROUTE 26 3101 P O BOX 457CONSTABLEVILLE NY 13325	01/28/2016	01/28/2021
DOL	DOL		TERRY THOMPSON		11371 RIDGE RD WOLCOTT NY 14590	02/03/2020	02/03/2025
DOL	DOL		TEST		P.O BOX 123 ALBANY NY 12204	05/20/2020	05/20/2025
DOL	DOL	****5570	TESTA CORP		50 SALEM STREET - BLDG B LYNNFIELD MA 01940	01/23/2017	01/23/2022
DOL	DOL	****5766	THE COKER CORPORATION	COKER CORPORATIO N	2610 SOUTH SALINA ST SUITE 14SYRACUSE NY 13205	12/04/2018	12/04/2023
DOL	DOL	****8174	THE DALRYMPLE CORPORATION		UNIT 278 541 10TH STREET NWLANTA GA 30318	12/01/2015	12/01/2020
DOL	DOL	****8174	THE DALRYMPLE GROUP LLC		289 JONESBORO RD/ STE 216 MCDONOUGH GA 30253	12/01/2015	12/01/2020
DOL	DOL		TIMOTHY A PALUCK		C/O TAP STEEL INC RTE 26 3101/ P O BOX 457CONSTABLEVILLE NY 13325	01/28/2016	01/28/2021
DOL	DOL	****3453	TORCHIA'S HOME IMPROVEMENT		10153 ROBERTS RD SAUQUOIT NY 13456	08/09/2016	08/09/2021
DOL	DOL	****8311	TRIPLE B FABRICATING, INC.		61 WILLETT ST. PASSAIC NJ 07503	10/26/2016	10/26/2021
DOL	DOL	****9407	TURBO GROUP INC		15-68 208TH STREET BAYSIDE NY 11360	06/23/2016	06/23/2021
DOL	DOL	****6392	V.M.K CORP.		8617 THIRD AVE BROOKLYN NY 11209	09/17/2018	09/17/2023
DOL	NYC		VALERIE VISCONTI		346 THIRD AVENUE PELHAM NY 10803	11/19/2015	11/19/2020
DOL	NYC	****7361	VIALE HOLDINGS, INC.	MOVING MAVEN	1010 NORTHERN BLVD. GREAT NECK NY 11021	03/09/2017	03/09/2022
DOL	DOL		VICTOR ALICANTI		42-32 235TH ST DOUGLSTON NY 11363	01/14/2019	01/14/2024
DOL	DOL		VICTOR ROTENBERG		C/O GMDV TRANS INC 67048 182ND STREETFRESH MEADOWS NY 11365	06/24/2016	06/24/2021
DOL	NYC		VIKTAR PATONICH		2630 CROPSY AVE BROOKLYN NY 11214	10/30/2018	10/30/2023

**NYS DOL Bureau of Public Work Debarment List 07/28/2020**

**Article 8**

DOL	DOL		VIKTORIA RATH		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	NYC		VITO GARGANO		1535 RICHMOND AVE STATEN ISLAND NY 10314	12/13/2017	12/13/2022
DOL	NYC	****3673	WALTERS AND WALTERS, INC.		465 EAST AND THIRD ST MT. VERNON NY 10550	09/09/2019	09/09/2024
DOL	DOL		WAYNE LIVINGSTON JR	NORTH COUNTRY DRYWALL AND PAINT	23167 COUNTY ROUTE 59 DEXTER NY 13634	10/24/2016	10/24/2021
DOL	DOL	****3296	WESTERN NEW YORK CONTRACTORS, INC.		3841 LAYNARD COURT NEW PORT RICHEY FL 34652	07/09/2019	07/09/2024
DOL	DOL		WHITE PLAINS CARPENTRY CORP		442 ARMONK RD	06/12/2018	06/12/2023
DOL	DOL		WILLIAM C WATKINS		1229 JAMES STREET SYRACUSE NY 13203	05/02/2017	05/02/2022
DOL	DOL		WILLIAM DEAK		C/O MADISON AVE CONSTR CO 39 PENNY STREETWEST ISLIP NY 11795	11/02/2016	11/02/2021
DOL	DOL	****6195	WILSON BROTHER DRYWALL CONTRACTORS		36 ABERSOLD STREET ROCHESTER NY 14621	08/31/2015	08/31/2020
DOL	DOL	****4043	WINDSHIELD INSTALLATION NETWORK, INC.		200 LATTA BROOK PARK HORSEHEADS NY 14845	03/08/2018	03/08/2023
DOL	DOL	****4730	XGD SYSTEMS, LLC	TDI GOLF	415 GLAGE AVE #302STUART FL 34994	10/31/2018	10/31/2023
DOL	DOL	****7345	YES SERVICE AND REPAIRS CORPORATION		145 LODGE AVE HUNTINGTON STATION NY 11476	08/09/2016	08/09/2021
DOL	DOL		YURIY IVANIN		C/O MOUNTAIN'S AIR INC 2471 OCEAN AVENUE-STE 7ABROOKLYN NY 11229	09/24/2012	09/18/2020
DOL	NYC		ZAKIR NASEEM		30 MEADOW ST BROOKLYN NY 11206	10/10/2017	10/10/2022
DOL	NYC	****8277	ZHN CONTRACTING CORP		30 MEADOW ST BROOKLYN NY 11206	10/10/2017	10/10/2022



AGREEMENT made as of the            day of            in the year of Two Thousand Twenty.

BETWEEN the Owner  
(Name and address)

and the Contractor:  
(Name and address)

The Project is:  
(Name and location)

The Architect is:  
(Name and address)

The Owner and Contractor agree as set forth below.

**ARTICLE 1**  
**THE CONTRACT DOCUMENTS**

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, specifications, Addenda issued prior to execution of this Agreement, other documents listed in Article 9 of this Agreement and Modifications issued after execution of this Agreement; these form the Contract, and are 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 execute the entire Work described in the Contract Documents or reasonably inferable by the Contractor as necessary to produce the results intended by the Contract Documents, except to the extent 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 and substantial completion of the work of this contract shall be in accordance with the schedule set forth in the Project Manual.

**3.2** Time is of the essence respecting the contract documents and all obligations thereunder.

**3.3** Upon the execution of this Agreement, the Contractor shall provide the Owner with copies of all contracts entered into between the Contractor and subcontractors or material suppliers. The Contractor's obligation to provide the Owner with said contracts shall continue for the duration of the Project.

**ARTICLE 4**  
**CONTRACT SUM**

**4.1** The Owner shall pay the Contractor in current funds for the Contractor's performance of the Contract the Contract Sum of \_\_\_\_\_, subject to additions and deductions as provided in the Contract Documents.

**4.2** The Contract Sum is based upon the following alternates, if any, which are described in the Bid Proposal Form (attached hereto) and are hereby accepted by the Owner:

Mount Pleasant CSD/Physical	005000-2	#4.1449.08
Education Department Renovations		
at Westlake High School		
NYSED #66-08-01-06-0-005-020		

4.3 Unit prices are as set forth in Exhibit A hereto.

**ARTICLE 5**  
**PROGRESS PAYMENTS**

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

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

All progress payments shall be based upon an estimate and a certificate, made by the Architect, of the materials furnished, installed and suitably stored at the site and the work done by the Contractor, and payment shall be made in installments of ninety-five percent (95%) of the amount certified as earned so that, at the completion of the work, there will be a retainage of five percent (5%) of the Total Contract Sum. Retainage shall be paid to the Contractor upon final completion of the work of this contract. All progress payments made previous to the last and final payment shall be based on estimates and the right is hereby reserved by the Architect for the Owner to make all due and proper corrections in any payment for any previous error.

The Contractor shall submit with each application for payment the following:

1. A current Sworn Statement from the Contractor setting forth all subcontractors and materialmen with whom the Contractor has subcontracted, the amount of such subcontract, the amount requested for any subcontractor or materialman in the application for payment and the amount to be paid to the Contractor from such progress payment;

2. Commencing with the second (2nd) Application for Payment submitted by the Contractor, duly executed so-called "after the fact" waivers of mechanics' and materialmen's liens from all subcontractors, materialmen and, when appropriate, from lower tier subcontractors, establishing receipt of payment or satisfaction of payment of all amounts requested on behalf of such entities and disbursed prior to submittal by the Contractor of the current Application for Payment, plus sworn statements from all subcontractors, materialmen and, where appropriate, from lower tier subcontractors, covering all amounts described in this Paragraph 5.2;

3. Such other information, documentation and materials as the Owner or the Architect may require.

**5.3** Payment shall not be released to the Contractor until the Owner receives the following documentation:

1. Certified payroll for employees and employees of subcontractors performing work on the Project.

2. Copies of invoices submitted to the Contractor by its subcontractors and/or material suppliers.

## **ARTICLE 6** **FINAL PAYMENT**

Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when (1) the Contract has been fully performed including compliance with all provisions of the Contract Documents except for the Contractor's responsibility to correct nonconforming Work under Article 15(B) of the General Conditions and to satisfy other requirements, if any, which necessarily survive final payment; and (2) a final 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 Architect's final Certificate for Payment, or as follows or as soon thereafter as is practicable.

## **ARTICLE 7** **MISCELLANEOUS PROVISIONS**

**7.1** Where reference is made in this Agreement to a provision of the General Conditions or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

**7.2** The Contractor represents and warrants the following to the Owner (in addition to any other representations and warranties contained in the Contract Documents) as an inducement to the Owner to execute this Agreement, which representations and warranties shall survive the execution and delivery of this Agreement, any termination of this Agreement and the final completion of the Work:

1. that it and its Subcontractors are financially solvent, able to pay all debts as they mature and possessed of sufficient working capital to complete the Work and perform all obligations hereunder;

2. that it is able to furnish the plant, tools, materials, supplies, equipment and labor required to complete the Work and perform its obligations hereunder;

3. that it is authorized to do business in the State of New York and the United States and properly licensed by all necessary governmental and public and quasi-public authorities having jurisdiction over it and over the Work and the Project;

4. that its execution of this Agreement and its performance thereof is within its duly authorized powers;

5. that its duly authorized representative has visited the site of the Project, is familiar with the local and special conditions under which the Work is to be performed and has correlated on-site observations with the requirements of the Contract Documents; and

6. that it possesses a high level of experience and expertise in the business administration, construction, construction management and superintendence or projects of the size, complexity and nature of the particular Project, and that it will perform the Work with the care, skill and diligence of such a contractor.

The foregoing warranties are in addition to, and not in lieu of, any and all other liability imposed upon the Contractor by law with respect to the Contractor's duties, obligations and performance hereunder. The Contractor's liability hereunder shall survive the Owner's final acceptance of and payment for the Work. All representations and warranties set forth in this Agreement, including without limitation, this Paragraph 7.2, shall survive the final completion of the Work or the earlier termination of this Agreement. The Contractor acknowledges that the Owner is relying upon the Contractor's skill and experience in connection with the Work called for hereunder.

## **ARTICLE 8** **TERMINATION OR SUSPENSION**

**8.1** The Contract may be terminated by the Owner as provided in the General Conditions.

**8.2** The Work may be suspended by the Owner as provided in the General Conditions.

**ARTICLE 9**  
**ENUMERATION OF CONTRACT DOCUMENTS**

**9.1** The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated as follows:

**9.1.1** The Agreement is this executed Agreement between Owner and Contractor.

**9.1.2** The General Conditions are the General Conditions of the Contract for Construction as set forth in the Project Manual and attached hereto.

**9.1.3** The Specifications are as set forth in the Project Manual and indexed in Exhibit "B" hereto.

**9.1.4** The Drawings are those as indexed in Exhibit "C" hereto.

**9.1.5** The Addenda, if any, are as follows:

Addendum No.	Date	Number of Pages
--------------	------	-----------------

**This Agreement is entered into as of the day and year first written above and is executed in at least three original copies of which one is to be delivered to the Contractor, one to the Architect for use in the administration of the Contract, and the remainder to the Owner.**

OWNER

CONTRACTOR

By \_\_\_\_\_  
(Signature) President

By \_\_\_\_\_  
(Signature) President

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

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

SECTION 006100 – BOND REQUIREMENTS  
See the conditions set forth in Article 11 of the General Conditions

- 1.01 Prior to Owner signing the contract agreement, he will require the Contractor (s) to furnish separate performance and labor and material payment bonds covering the faithful performance of the entire construction contract agreement.

The performance bond and the labor and material payment bond shall each be made out in one hundred percent (100%) of the guaranteed maximum contract amount.

- 1.02 The Contractor (s) shall include in his proposal amount the total premiums for the performance and labor and material payment bonds.





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## ***Bid Bond***

**CONTRACTOR:**

*(Name, legal status and address)*

**SURETY:**

*(Name, legal status and principal place of business)*

**OWNER:**

*(Name, legal status and address)*

**BOND AMOUNT: \$**

**PROJECT:**

*(Name, location or address, and Project number, if any)*

Uninterruptible Power Supply (UPS)

**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. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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.

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Init.

Signed and sealed this day of ,

\_\_\_\_\_  
(Contractor as Principal) (Seal)

\_\_\_\_\_  
(Witness)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(Surety) (Seal)

\_\_\_\_\_  
(Witness)

\_\_\_\_\_  
(Title)

Init.



# AIA<sup>®</sup> Document A312™ – 2010

## Performance Bond

**CONTRACTOR:**

*(Name, legal status and address)*

**SURETY:**

*(Name, legal status and principal place of business)*

**OWNER:**

*(Name, legal status and address)*

**CONSTRUCTION CONTRACT**

Date:

Amount: \$

Description:

*(Name and location)*

Uninterruptible Power Supply (UPS)

**BOND**

Date:

*(Not earlier than Construction Contract Date)*

Amount: \$

Modifications to this Bond:  None  See Section 16

**CONTRACTOR AS PRINCIPAL**

Company: *(Corporate Seal)*

**SURETY**

Company: *(Corporate Seal)*

Signature: \_\_\_\_\_

Name and

Title:

Signature: \_\_\_\_\_

Name and

Title:

*(Any additional signatures appear on the last page of this Performance Bond.)*

*(FOR INFORMATION ONLY — Name, address and telephone)*

**AGENT or BROKER:**

**OWNER'S REPRESENTATIVE:**

*(Architect, Engineer or other party.)*

**ADDITIONS AND DELETIONS:**

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

Init.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

- .1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- .2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- .3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- .2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

Init.

§ 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.

§ 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:

*(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)*

**CONTRACTOR AS PRINCIPAL**

Company: \_\_\_\_\_  
*(Corporate Seal)*

**SURETY**

Company: \_\_\_\_\_  
*(Corporate Seal)*

Signature: \_\_\_\_\_

Name and Title: \_\_\_\_\_

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

Signature: \_\_\_\_\_

Name and Title: \_\_\_\_\_

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

Init.



# AIA<sup>®</sup> Document A312™ – 2010

## Payment Bond

**CONTRACTOR:**  
*(Name, legal status and address)*

**SURETY:**  
*(Name, legal status and principal place of business)*

**OWNER:**  
*(Name, legal status and address)*

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

### CONSTRUCTION CONTRACT

Date:  
Amount: \$  
Description:  
*(Name and location)*

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

### BOND

Date:  
*(Not earlier than Construction Contract Date)*

Amount: \$

Modifications to this Bond:  None  See Section 18

**CONTRACTOR AS PRINCIPAL**  
Company: *(Corporate Seal)*

**SURETY**  
Company: *(Corporate Seal)*

Signature: \_\_\_\_\_  
Name and Title:

Signature: \_\_\_\_\_  
Name and Title:

*(Any additional signatures appear on the last page of this Payment Bond.)*

*(FOR INFORMATION ONLY — Name, address and telephone)*

**AGENT or BROKER:**

**OWNER'S REPRESENTATIVE:**  
*(Architect, Engineer or other party.)*

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- .1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- .2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

#### § 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- .1 the name of the Claimant;
- .2 the name of the person for whom the labor was done, or materials or equipment furnished;
- .3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- .4 a brief description of the labor, materials or equipment furnished;
- .5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- .6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- .7 the total amount of previous payments received by the Claimant; and
- .8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 **Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 **Contract Documents.** All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

*(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)*

**CONTRACTOR AS PRINCIPAL**

**SURETY**

Company: \_\_\_\_\_  
(Corporate Seal)

Company: \_\_\_\_\_  
(Corporate Seal)

Signature: \_\_\_\_\_  
Name and Title: \_\_\_\_\_  
Address: \_\_\_\_\_

Signature: \_\_\_\_\_  
Name and Title: \_\_\_\_\_  
Address: \_\_\_\_\_

SECTION 006300 – REQUESTS FOR INFORMATION (RFI)  
Coordinate with Subpara 6(T)(2) of the General Conditions

PART 1 - GENERAL

- 1.01 This document is for issuance at the Post Bid/Pre-Construction Conference and specifies administrative and procedural requirements for handling requests for information (RFI's) made after award of Contract.
- 1.02 Attention is directed to Sections 013300 and 013200 of Division #1 as same concerns construction progress schedules, submittals of shop drawings, samples and product data in general.
- 1.03 SUBMITTALS PROCEDURES: RFI's shall be submitted in the following manner:
- A. One (1) completed copy of form following to Architect with copies to Owner (as directed) and appropriate Consultants with the following minimum information:
1. Work identified by RFI listing affected Drawing(s) and specific detail(s) and Specification paragraph reference(s).
  2. Identify specific field conditions and "as-built" conditions on sketches attached to RFI submittal.
  3. If RFI addresses conflict(s) in, or between Contract Documents, describe completely and provide such data necessary to permit thorough and proper response by affected discipline.
  4. Indicate proposed solution along with any impacts on cost and construction time.
  5. Listing of Trade/Specialty Contractors affected by RFI and indication that RFI proposal has been coordinated with said contractors.

INCOMPLETE RFI'S WILL BE RETURNED TO CONTRACTOR WITHOUT ACTION  
TAKEN.

- 1.04 REVIEW PROCEDURES/ACTIONS
- A. Architect/Engineer may request additional information or documentation as may be deemed necessary for fair evaluation of RFI.
- B. Architect/Engineer will respond with reasonable promptness as outlined in Section 013300 in writing and may, if deemed appropriate issue a "Bulletin" (as defined in the General Conditions) as a clarification to the Contract Documents.

END OF SECTION 006300



# DRAFT AIA® Document G716™ - 2004

## Request for Information ("RFI")

TO:	FROM:	
PROJECT:	ISSUE DATE:	RFI No. 001
PROJECT NUMBERS: /	REQUESTED REPLY DATE:	
	COPIES TO:	

RFI DESCRIPTION: *(Fully describe the question or type of information requested.)*

REFERENCES/ATTACHMENTS: *(List specific documents researched when seeking the information requested.)*

SPECIFICATIONS:

DRAWINGS:

OTHER:

SENDER'S RECOMMENDATION: *(If RFI concerns a site or construction condition, the sender may provide a recommended solution, including cost and/or schedule considerations.)*

RECEIVER'S REPLY: *(Provide answer to RFI, including cost and/or schedule considerations.)*

BY	DATE	COPIES TO
----	------	-----------

**Note:** This reply is not an authorization to proceed with work involving additional cost, time or both. If any reply requires a change to the Contract Documents, a Change Order, Construction Change Directive or a Minor Change in the work must be executed in accordance with the Contract Documents.



***GENERAL CONDITIONS***  
*of the*  
***CONTRACT for CONSTRUCTION***

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## GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The within document includes detailed provisions concerning the capital improvement work to be performed by the Contractors engaged by the School District. This document contains provisions which relate particularly to capital improvement projects in the school district setting in New York State. The document is incorporated by reference into all contracts to be awarded and should be reviewed carefully by the Contractor to whom the award of contract is made. Consultation with an attorney and insurance representative is advised.

### ARTICLE 1 DEFINITIONS

- A. "Addendum" or "Addenda" refers to revised drawings and/or written requirements for the capital improvement work issued by the Architect prior to the time indicated for submission of a bid by a contractor.
- B. The "Architect" is the design professional engaged by the School District to perform design related functions respecting the capital improvement projects to be performed in the School District.
- C. "Board of Education" refers to the Board of Education of the School District.
- D. "Central Administration" refers to the Superintendent of Schools, his/her Assistant Superintendents, and Director of Plant & Facilities.
- E. The "Construction Manager" is the entity engaged by the School District to act as its representative during the course of construction of the Project.
- F. The "Contractor" refers to the entity engaged by the School District to perform all or a part of the capital improvement project on its behalf.
- G. The "Drawings" are the plans, elevations, sections, details, schedules and diagrams developed by the Architect for the capital improvement projects to be performed in accordance with the project manual of which these General Conditions of the Contract for Construction form a part.
- H. The "Project" refers to the entire capital improvement project to be performed in accordance with the project manual and may include work by the Owner.
- I. The "Project Manual" is the bound document which is issued simultaneously with the project Drawings and includes the Notice to Bidders, Information to Bidders, Bid Proposal Form, Prevailing Wage Rate schedule and the written requirements for labor, materials, equipment, construction systems and the like necessary for the Contractor to complete the capital improvement work for which it has been engaged.

J. The "Owner" refers to the School District, the Board of Education, its officers, agents and employees.

K. A "Subcontractor" is a person or entity who has a direct contract with the Contractor to provide material and/or labor for the project on or off the site, or to otherwise furnish labor, material or other services with respect to a portion of the Contractor's work. A "Sub-subcontractor" is a person or entity who has a direct or indirect contract with a Subcontractor engaged by the Contractor to perform a portion of the Subcontractor's work at the site, or to otherwise furnish labor, material or other services with respect to a portion of the Subcontractor's work.

L. The term "Specialist" or "Specialty Contractor" as used in these specifications shall mean an individual or firm of established reputation, or, if newly organized, whose personnel have previously established a reputation in the same field, which is regularly engaged in, and which maintains a regular force of workers skilled in either manufacturing or fabricating items required by the Contract, installing items required by the Contract, or otherwise performing work required by the Contract.

M. "Accepted", "directed" "permitted," "requested," "required," and "selected" mean, unless otherwise explained, "accepted by the Architect and/or Owner" "directed by the Architect and/or Owner," "permitted by the Architect and/or Owner," "requested by the Architect and/or Owner," "required by the Architect and/or Owner," and "selected by the Architect and/or Owner." However, no such implied meaning will be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.

N. "As accepted" "or acceptable substitute", and "for review" mean the Architect is the sole judge of the quality and suitability of the proposed substitutions. Where used in conjunction with the Architect's response to submittals, requests, applications, inquiries, reports, and claims by the Contractor, the meaning will be held to the limitations of the Architect's responsibilities and duties as stated in the General Conditions. In no case will "accepted by the Architect" be interpreted as an assurance to the Contractor that the requirements of the Contract Documents have been fulfilled.

O. "Furnish" means supply and deliver to the Project site or other designated location, ready for unloading, unpacking, storing, assembly, installation, application, erection, or other form of incorporation into the Project, and maintained ready for use. Supply and deliver products requiring additional or supplemental fitting, assembly, fabrication, or incorporation into other elements of the Project directly to the fabricator, installer or manufacturer as required.

P. "Install" means unload, unpack, use, fit, attach, assemble, apply, place, anchor, erect, finish, cure, protect, clean, and similar operations required to properly incorporate work into the Project.

Q. "Provide" means furnish and install.

R. "Replace" means remove designated, damaged, rejected, defective, unacceptable, or non-conforming work from the Project and provide new work meeting the requirements of the Contract Documents in place thereof.

S. The word "include", in any form other than "inclusive", is non-limiting and is not intended to mean all-inclusive.

## ARTICLE 2 CONTRACTOR'S REPRESENTATIONS

A. Upon submission of its bid to the Owner, the Contractor expressly represents:

1. The Contractor represents and warrants that it performed a detailed investigation of the site(s) and that such investigation was sufficient to disclose the conditions of the site(s) at which work is to be performed by it and all improvements thereon, and the conditions under which the work is to be performed, including, but not limited to (a) the location, condition, layout and nature of the project site and surrounding areas; (b) the cost of labor, materials and equipment necessary to perform the work, the availability; (c) the areas of the work which will cause a disruption to the necessary and proper operation of the facilities by the Owner; and (d) other pertinent limitations on the performance of its work.

2. The Contractor represents and warrants that it has carefully studied and compared the drawings and pertinent provisions of the project manual and that any errors, omissions, ambiguities, discrepancies or conflicts found in said documents have been brought to the attention of the Architect for clarification prior to the Contractor's submission of its bid. If, in the interpretation of Contract Documents, requirements within the Drawings and Specifications conflict, or it appears that the Drawings and Specifications are not in agreement, the requirement to be followed shall be decided by the Architect. Where there is a discrepancy in quantity, the Contractor shall provide the greater quantity; where there is a discrepancy in quality, the Contractor shall provide the superior quality. Addenda supersede the provisions that they amend.

3. Each contractor certifies that it is experienced and familiar with the requirements and conditions imposed during the construction of similar work in the area. This includes, but is not limited to, "out of sequence" or "come back" work for the removal of plant, equipment, temporary wiring or plumbing, etc. This "out of sequence" work may also include phasing of construction activities to accommodate the installation of the work at various locations and orderly fashion and the completion of work at various locations and/or levels at various times. This "phasing", "out of sequence", or "come back" work shall be done at no cost to other contractors, the Owner, Architect or the Construction Manager.

B. The Contractor warrants to the Owner that (1) the materials and equipment furnished under its contract will be of good quality and new, and of recent manufacture, unless otherwise required or permitted by the Contract Documents, (2) that its work will be free from defects not inherent in the quality required or permitted, and (3) that its work will conform with the terms and conditions of its agreement with the Owner. Work not conforming to these requirements,

including substitutions not properly approved and authorized, shall be considered defective and shall be removed and replaced at the Contractor's cost and expense. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

C. Except as to any reported errors, inconsistencies or omissions, and to concealed or unknown conditions, by executing the Agreement, the Contractor represents the following:

1. The drawings and accompanying specifications found in the project manual issued simultaneously with said drawings are sufficiently complete and detailed for the Contractor to (a) perform the work required to produce the results intended by the Owner and (b) comply with all the requirements of its contract with the Owner.

2. The work required to be performed by the Contractor including, without limitation, all construction details, construction means, methods, procedures and techniques necessary to perform its work, use of materials, selection of equipment and requirements of product manufacturers are consistent with: (a) good and prevailing and accepted industry standards applicable to its work; (b) requirements of any warranties applicable to its work; and (c) all laws, ordinances, regulations, rules and orders which bear upon the Contractor's performance of its work.

3. The Drawings and Specifications for the Contract have been prepared with care and are intended to show as clearly as is practicable the work required to be done. Work under all items in the Contract must be carried out to meet field conditions to the satisfaction of the Architect and Owner and in accordance with his instructions and the Contract Drawings and Specifications.

4. All dimensions shown on the Drawings are for bidding purposes only. It is the responsibility of the Contractor to verify all dimensions in the field to insure proper and accurate fit of materials and items to be installed.

D. The representations set forth herein shall survive expiration and/or termination of the Contractor's agreement with the Owner.

### **ARTICLE 3 CONTRACTOR'S CONSTRUCTION PROCEDURES**

A. 1. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures required for the proper execution of its work on the project. Where the drawings and/or project manual make reference to particular construction means, methods, techniques, sequences or procedures or indicate or imply that such are to be used in connection with the Contractor's work, such reference is intended only to indicate that the Contractor's work is to produce at least the quality of the work implied by the operations described, but the actual determination as to whether or not the described operations may be safely or suitably employed in the performance of the Contractor's work shall be the sole

responsibility of the Contractor. All loss, damage, liability, or cost of correcting defective work arising from the employment of a specific construction means, method, technique, sequence or procedure shall be borne solely by the Contractor.

2. Neither the Architect, the Construction Manager or the Owner will have control over or charge of and will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility as provided herein.

3. The Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, rigging, water, heat, utilities, light, transportation, and other facilities and services necessary for proper execution and completion of its work, whether temporary or permanent and whether or not incorporated or to be incorporated in its work.

B. The Contractor shall be responsible for coordinating the work of its own forces and the work of subcontractors engaged by it to perform the work of the project on its behalf. The Contractor shall supply to its own work forces, and subcontractors engaged by it to perform portions of its work, copies of the drawings and project manuals for the work to be performed by such individuals/entities on its behalf. The Contractor shall review any specified or installation procedure with its employees and/or subcontractors, including those recommended by any product manufacturer, prior to the commencement of the relevant portion of the work to be performed. The Contractor shall be responsible to the Owner for the acts and/or omissions of the Contractor's employees, the Contractor's Subcontractors, the Contractor's material suppliers, and/or their respective agents and employees, and any other persons performing portions of the work on behalf of the Contractor.

C. The Contractor shall be responsible for the inspection of portions of the project performed by its own work force and/or subcontractors engaged by it for the purpose of determining that said work is in proper condition to receive subsequent work.

D. The Contractor shall perform its work in accordance with the standards of the construction industry applicable to work in the locale in which work is to be performed.

E. The Contractor shall only employ labor on the project or in connection with its work capable of working harmoniously will all trades, crafts and any other individuals associated with the capital improvement work to be performed. There shall be no strikes, picketing, work stoppages, slowdowns or other disruptive activity at the project for any reason by anyone employed or engaged by the Contractor to perform its portion of the work. There shall be no lockout at the project by the Contractor. The Contractor shall be responsible for providing the manpower required to proceed with the work under any circumstance. Should it become necessary to create a separate entrance for a contractor involved in a labor dispute, all costs associated with creating that entrance shall be borne by the contractor involved in the dispute. Such costs shall include, but not be limited to, signage, fencing, temporary roads and security personnel as deemed necessary by the Owner for the safety of the occupants of the site.

F. 1. If the Contractor has engaged the services of workers and/or subcontractors who are members of trade unions, the Contractor shall make all necessary arrangements to reconcile, without delay, damage or cost to the Owner and without recourse to the Architect, the Construction Manager or the Owner, any conflict between its agreement with the Owner and any agreements or regulations of any kind at any time in force among members or councils which regulate or distinguish what activities shall not be included in the work of any particular trade.

2. In case the progress of the capital improvement work to be performed by the Contractor is effected by any undue delay in furnishing or installing any items or materials or equipment required pursuant to its agreement with the Owner because of a conflict involving any such labor agreement or regulation, the Owner may require that other material or equipment of equal kind and quality be provided pursuant to a Change Order or Construction Change Directive but in no case shall the amount of such change be charged by the Contractor to the Owner as an additional cost to perform the capital improvement work pursuant to its contract.

3. The Contractor shall ensure that its work continues uninterrupted during the pendency of a labor dispute.

4. The Contractor shall be liable to the Owner for all damages suffered by the Owner occurring as a result of work stoppages, slowdowns, disputes or strikes.

G. The Contractor shall enforce strict discipline and good order among the Contractor's employees and its Subcontractors' work forces and other persons carrying out the performance of its work. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. The Owner reserves the right to object to any person to be hired or who is employed by the Contractor. Upon the request of the Owner, said person shall be removed from the Project and not again be assigned to perform the Contractor's work without the written permission of the Owner.

H. Within one (1) week after a Notice to Proceed is received, the Contractor shall employ a competent, full-time Project Manager and On Site Superintendent to be approved by the Owner or its representative, and such necessary assistants who shall be in attendance at each project site whenever and wherever work is in progress to provide for the expeditious completion of the work. Said Project Manager and On Site Superintendent shall be employed until punchlist and closeout of the Project. To the extent work is being performed contemporaneously at different facilities within the School District, the Contractor shall assign different superintendents for each facility at which work is being performed. The Project Manager and On Site Superintendent assigned by the Contractor shall not be changed except with the consent of Owner, unless the Project Manager or On Site superintendent or such assistant proves to be unsatisfactory to the Contractor and/or ceases to be in its employ. The Project Manager and On Site Superintendent shall represent the Contractor, and communications given to the Project Manager or On Site Superintendent, whether verbal or written, shall be as binding as if given to the Contractor. Oral communications to the superintendent(s) or his/her assistant(s) and/or project manager shall be confirmed in writing by the Owner or Architect. The Contractor shall forward to the Owner a copy of the resumes for each of its superintendents, project managers and their assistants. The

Owner, the Construction Manager or the Architect shall have the right to have any supervisory or management staff removed from the project with or without cause.

I. Each Contractor shall provide, or otherwise see that, the project manager, or on site superintendent site managers, and/or responsible workers of each Contractor and major subcontractor are equipped with cellular phones and radios. Each Contractor shall provide the Owner, the Construction Manager and the Architect with the number for each phone and worker.

J. The Contractor's supervisory personnel, including superintendents and their assistants, shall be versed in the English language. In the event the Contractor's supervisory personnel, superintendents and/or their assistants are not versed in the English language, the Contractor shall employ the services of a full-time on-site interpreter to facilitate communications with such supervisory personnel, superintendents and/or assistants.

K. Prior to the commencement of work, the Contractor shall provide the Construction Manager and the Architect with:

1. a written list of the names, addresses and telephone numbers of the members of its organization who can be contacted in the event of an off-hours emergency at the building site, including cellular telephone numbers and personal/home telephone numbers.
2. a written list of subcontractors, sub-subcontractors, suppliers and vendors with names, addresses, telephone numbers, and descriptions of the work they shall perform or furnish.
3. The name, address and telephone number of the bonding company, banking and insurance company for the Prime Contractor employed by the Prime Contractor including the name, address and telephone number of each bonding company's primary contact representative for this project.
4. Detailed subcontractor schedules indicating the approximate quantity of shop drawings, sequence, timing and man loading.
5. A cash flow projection for the life of the project, including a schedule and graph showing the amount of work projected to be completed each month or billing period and a dollar value for the anticipated billings each month or billing period. This shall be completed after an agreed upon schedule of values has been approved by the Construction Manager.

L. 1. Tests, inspections and approvals of portions of the Contractor's work required by the drawings and/or specifications shall be made at an appropriate time. Unless otherwise provided, the Contractor shall consult with the Architect and the Construction Manager concerning the need for testing and/or inspection of its work pursuant to the Contract Documents and, after consulting with the Architect and Construction Manager, the Construction

Manager shall advise the Owner to 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. The Owner shall bear all costs associated with the tests, inspections or approvals required by the drawings and/or specifications except as set forth in subparagraph 3 hereof.

2. Tests, inspections and approval of portions of the Contractor's work required by laws, ordinances, rules, regulations or orders of public authorities or governmental agency having jurisdiction shall be made at an appropriate time. The Contractor shall consult with the Architect and the Construction Manager concerning the need for testing and/or inspection of its work pursuant to law, ordinance, regulation or orders of public authorities or governmental agencies and shall advise the Owner in writing that it has made arrangements for such tests, inspections and approvals with the appropriate public authority or governmental agency. The Contractor shall be solely responsible for making timely notice of the need for a test, inspection and/or approval with the relevant public authority or governmental agencies and shall bear all costs associated with such testing, inspection or approval required by such public authority or governmental agency.

3. If the Architect, the Construction Manager, the Owner, or public authorities or governmental agencies having jurisdiction determine that portions of the Contractor's work require additional testing, inspection or approval due to the Contractor's failure to perform its work in accordance with the requirements of the Contract Documents and/or laws, ordinances, rules, regulations or orders of public authorities or governmental agencies having jurisdiction, the Architect and the Construction Manager will advise the Owner of the need for such additional inspections or tests and the Owner shall make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner. The Contractor shall bear the costs of such additional testing as provided in Article 14.

M. The Contractor shall, if required by ordinances, laws, codes, rules and/or regulations of the governing agencies having jurisdiction over this project, retain a licensed professional engineer to supervise the construction of this project including, but not limited to, foundations, structural work, soils, welding, reinforced masonry and the like.

N. The Contractor recognizes and acknowledges that the within project is governed by and subject to the provisions of New York State General Municipal Law, section 101, governing the award of contracts on public improvement projects. As such, the Contractor recognizes and acknowledges that other contractors will be performing work on the project in conjunction with it. As such the Contractor agrees to cooperate with such other contractors performing work on the project and shall perform its work as follows:

1. The Contractor shall not interfere with the erection, installation or storage upon the premises of any work, materials, supplies or equipment which is to be performed and furnished by other contractors, and the Contractor shall properly connect and coordinate its work therewith.

2. The Contractor shall not commit or permit any act which will interfere with the performance of the work of any other contractor performing work on the project. If the Contractor sustains any damage through any act or omission of other contractors having a contract with the Owner for the performance of work upon the site or of work which may be necessary to be performed for the proper execution of the work to be performed hereunder, or through any act or omission of a subcontractor of such contractor, the Contractor shall promptly notify the Owner and the Construction Manager of such damage.

3. The Contractor agrees to defend and indemnify Owner, Architect, Construction Manager, its Consultants and Sub-consultants, from all claims made against any of them arising out of Contractor's acts or omissions or the acts or omissions of any subcontractor of the Contractor which have caused damage to the Owner, Architect, Construction Manager or other contractor(s) on the project. The Owner's right to indemnification hereunder shall in no way be diminished, waived or discharged, or by the exercise of any other remedy provided for by the contract or by law. Further, the Owner shall withhold from an offending contractor's contract sum an amount sufficient to cover such damage and all expenses and costs associated with the damage sustained.

4. When the work of the Contractor or its subcontractors overlap or dovetail with that of other Contractors, materials shall be delivered and operations conducted to carry on the work continuously, in an efficient, workmanlike manner.

5. In case of interference between the operations of different Contractors, the Construction Manager will be the sole judge of the rights of each Contractor and shall have the authority to decide in what manner the work may proceed, and in all cases its decision shall be final. Any decision as to the method and times of conducting the work or the use of space as required in this paragraph shall not be basis of any claim for delay or damages by the Contractor.

6. The Contractor, including its subcontractors, shall keep itself informed of the progress of other contractors and shall notify the Architect or the Construction Manager immediately in writing of lack of progress on the part of other contractors where such delay will interfere with its own operations. Failure of the Contractor to keep informed of the work progressing on the project and failure to give notice of lack of progress by others shall be construed as acceptance by the Contractor of the status of the work as being satisfactory for proper coordination with the Contractor's own work.

7. Delays or oversights on the part of any contractor or subcontractor in getting any or all of their work done in the proper way, thereby causing cutting, removing and replacing work already in place, shall not be the basis for a claim for extra compensation.

8. If part of the Contractor's work depends for proper execution or results upon construction or operations by the Owner or another contractor, the Contractor shall, prior to proceeding with that portion of its work, promptly report to the Architect and Construction Manager 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 or other contractor's completed or partially completed construction is fit and proper to receive the Contractor's work.

9. The Contractor shall promptly correct discrepancies or defects in its work which have been identified by other contractors as affecting proper execution and results of the work of such other Contractor.

O. 1. The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authorities or governmental agencies bearing on performance of the Work. If the Contractor fails to give such notices, it shall be liable for and shall indemnify and hold harmless (a) the Owner, its consultants, employees, officers and agents, (b) the Architect and its consultants, employees, officers and agents, and/or (c) the Construction Manager and its consultants, employees, officers and agents against any resulting fines, penalties, judgments, or damages, including reasonable attorney's fees, imposed on or incurred by the parties indemnified hereunder.

2. The Contractor shall pay any costs or fees incurred in such compliance and any fines or penalties imposed for violation thereof and any costs or fees incurred by the Owner due to such violation. If the Contractor observes that portions of the Contract Documents are at variance therewith, the Contractor shall promptly notify the Architect and Owner in writing, and necessary changes shall be accomplished by appropriate modification to the drawings and/or specifications.

3. If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations without such notice to the Architect, the Construction Manager and Owner, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs and shall bear the total cost for correction of same.

4. If the Contractor fails to give such notices, it shall be liable for and shall indemnify and hold harmless (1) the Owner, its consultants, employees, officers and agents, (2) the Architect and its consultants, employees, officers and agents, and (3) the Construction Manager, its consultants, employees, officers and agents, against any resulting fines, penalties, judgments, or damages, including reasonable attorney's fees, imposed on or incurred by the parties indemnified hereunder. The Contractor shall pay any costs or fees incurred in such compliance and any fines or penalties imposed for violation thereof and any costs or fees incurred by the Owner due to such violation.

P. The Contractor recognizes and acknowledges that job meetings will be held at the job site weekly unless otherwise designated by the Owner or the Architect. The Contractor shall have responsible representation at the MANDATORY weekly job meetings held at the Construction Manager's job office. These meetings will be held to arrange for satisfactory coordination of all trades on the project so as not to impede job progress. Contractors or subcontractors failing to attend job meetings shall be responsible for delays and/or expenses incurred due to coordination difficulty.

Q. The Contractor shall provide copies of its daily construction reports to the Construction Manager's Field Superintendent. These reports shall be submitted no later than 10:00 am the following workday. The daily reports shall provide detailed information concerning the Contractor's activities and operations, including work activities on site and manpower. A "Daily Construction" form is included in these specifications and shall be used for reporting these activities. In addition, the Contractors are to submit a Two Week Look Ahead schedule for upcoming work. A "Two Week Look Ahead" form is included in these specifications for the Contractor's use.

#### **ARTICLE 4 CONTRACTOR'S USE OF SITE**

A. The Contractor shall confine operations at the site to the areas at which construction is to be performed and to such areas permitted by law, ordinances, permits and as set forth in detail in the project manual and drawings forming a part of its contract with the Owner.

B. Five (5) days after receipt of the Notice to Proceed, the Contractor shall provide two (2) copies of a video taped recording of all existing conditions to the Construction Manager. This taping shall provide a record of all existing buildings, grounds, exterior conditions and interior conditions. The Contractor shall schedule a representative of both the Owner and the Construction Manager to be present at this taping. In the absence of this record, the Contractor shall be responsible for paying the costs associated with any and all repairs in an area where the Contractor is working or has worked, as may be deemed necessary by the Owner or the Construction Manager.

C. The occupied portion of any school building shall always comply with the minimum requirements necessary to maintain a certificate of occupancy.

D. General Safety and Security Standards for Construction Projects:

1. All construction materials shall be stored in a safe and secure manner.
2. Fences around construction supplies or debris shall be maintained.
3. Gates shall always be locked unless a worker is in attendance to prevent unauthorized entry.
4. During exterior renovation work, overhead protection shall be provided for any sidewalks or areas immediately beneath the work site or such areas shall be fenced off and provided with warning signs to prevent entry.
5. The Contractor shall exert utmost care and diligence when working in or near any existing buildings or sitework. The absence of protection around such items shall not excuse the Contractor from its liability to provide protection. Any damage to existing buildings, sitework or facilities shall be repaired and charged to the Contractor responsible for the damage.

6. The Contractor shall be responsible for the removal and replacement of existing ceiling tiles and grid in areas of the existing building where its work is required and new ceilings are not scheduled for installation. In the event that the existing ceilings are damaged and cannot be replaced to the satisfaction of the Owner, the responsible contractor shall be liable for the costs of replacing in kind, the existing ceilings with new tile and grid.

7. All disconnect and/or tie-in work involving any utilities that would interfere with the ongoing operations of the Owner shall be completed after hours when the facility is not in use. The performance of this work shall be projected on all schedules required to be prepared by the Contractor. Additionally, the Contractor shall give the Construction Manager and the Owner at least forty-eight (48) hours advance notice of its intention to perform this type of work. All overtime and standby personnel necessary to complete these tie-ins shall be the responsibility of the Contractor performing the work.

E. 1. Separation of construction areas from occupied spaces: Construction areas which are under the control of a contractor and therefore not occupied by district staff or students shall be separated from occupied areas. Provisions shall be made to prevent the passage of dust and contaminants into occupied parts of the building. Periodic inspection and repairs of the containment barriers must be made to prevent exposure to dust or contaminants. Gypsum board must be used in exit ways or other areas that require fire rated separation. Heavy duty plastic sheeting may be used only for a vapor, fine dust or air infiltration barrier, and shall not be used to separate occupied spaces from construction areas. Methods of dust and fume control shall include, but not be limited to:

- a. Adequate ventilation;
- b. Wetting down;
- c. Keeping bags of insulating materials, cement, etc., closed.
- d. Controlled mixing of materials under field conditions;
- e. Special attention should be utilized in sawing of insulation and certain acoustical materials and storage of materials.
- f. Job housekeeping must be maintained;
- g. Advising all personnel of hazardous conditions, including supervisors and workers;

Each contractor is responsible for instituting the above policies to insure minimal impact to surrounding occupied areas.

2. A specific stairwell and/or elevator should be assigned for construction worker use during work hours. In general, workers may not use corridors, stairs or elevators designated for students or school staff.

3. Large amounts of debris must be removed by using enclosed chutes or a similar sealed system. There shall be no movement of debris through halls of occupied spaces of the building. No material shall be dropped or thrown outside the walls of the building.

4. All occupied parts of the building affected by renovation activity shall be cleaned at the close of each workday. School buildings occupied during a construction project shall maintain required health, safety and educational capabilities at all times that classes are in session.

F. 1. Storage space will be allotted to the Contractor by the Owner to the extent such space, in the sole discretion of the Owner, is available. The Contractor shall be responsible for securing appropriate space for its material with the Construction Manager prior to delivery. If insufficient space is available on the site, the Contractor shall provide local off-site storage, storage containers, etc. at its own cost and expense. Should any of the material stored on-site obstruct the progress of any portion of the work or the project, this material shall be removed by the Contractor without reimbursement of cost, from place to place or from the premises, as the Construction Manager may direct.

2. The Contractor shall schedule delivery of materials and equipment to minimize long term storage at the Project, to prevent overcrowding of construction spaces, and to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.

3. The Contractor shall deliver materials and equipment to the Project in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installation. The Contractor shall inspect materials and equipment upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected. The Contractor shall store products to allow for inspection and measurement of quantity or counting of units. The Contractor shall store materials in a manner that will not endanger the Project structure. The Contractor shall store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation. The Contractor shall comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

4. The Contractor shall not unreasonably encumber the site with materials or equipment during the performance of its work. Only materials and equipment which are to be used directly in the performance of the Contractor's work shall be brought to and stored on the premises of the School District. After equipment is no longer required for its work, the Contractor shall promptly remove such equipment from the premises of the School District. The Contractor

shall be solely responsible for the protection of construction materials and equipment stored on the premises from weather, theft, damage and all other adversity. The Contractor shall at all times provide the proper housekeeping to minimize potential fire hazards, and shall provide approved spark arresters on all steam engines, internal combustion engines and flues.

5. A construction entrance will be designated for deliveries. A separate entrance will be established for entering and exiting the site only. All deliveries shall be scheduled and coordinated with the Construction Manager and the Owner's Security department. Unexpected or uncoordinated deliveries may be turned away by the Owner or the Construction Manager at the discretion or necessity of the Owner. The Owner's enforcement of this provision shall not be construed by any contractor or subcontractor as the basis for a claim of delay in time or monetary damages alleged to have been incurred as a result of refusal of delivery.

6. The Contractor for General Construction shall provide necessary and required security measures to adequately safeguard the construction site from vandalism and intrusion of unauthorized persons. The Contractor for General Construction shall submit its means and methods of security to the Construction Manager for review and comment. The project site(s) must be secured 24 hours a day, 7 days a week including holidays. The General Construction Contractor's failure to secure the site as required by this paragraph will result in the Owner engaging the services of such necessary personnel so as to provide such security. No notice will be given the Contractor for General Construction of the Owner's intention to engage such security services and all costs and expenses associated with the Owner's security of the site in this regard will be back charged to the Contractor for General Construction. While the Owner may have security guards patrolling the project areas, the function of such security guards is not for the purpose of specifically guarding the Contractor's property or operations of work.

G. The Contractor's right to entry and use of the School District premises arises solely from the permission granted by the Owner pursuant to the agreement between the Contractor and the Owner. This permission shall be deemed to be withdrawn upon the termination of the Contractor's agreement with the Owner.

H. 1. The Contractor shall be required to perform its work with no interruption to the School District's operations, including its administrative and business operations. Any work which will interfere with the School District's operations and/or which is to be performed when the School District's facilities are in operation shall be performed on evenings and weekends. Additionally, the Contractor shall conduct its work in compliance with federal, state, county or local ordinances. All costs incurred by the Owner to make the facilities available during evening and weekends shall be borne by the Contractor. The Owner reserves the right to determine what work will "interfere" with its operations and said determination shall be final.

2. The Contractor may request access to the site during times beyond the work hours permitted. Approval is solely at the discretion of the Owner. If approval is given, the Contractor is responsible for paying all additional costs incurred by the Owner, Architect and the Construction Manager for providing the site to the Contractor during the additional time periods.

3. In the event the Contractor fails to complete all work under this contract by said scheduled dates, the Contractor will not be permitted to perform any work during normal school hours. Such work shall only be performed after school hours, Saturdays, Sundays, holidays or periods when school is unoccupied at no additional cost of any kind to the Owner. In addition to damages incurred by the Owner in connection with the Contractor's delay, the Contractor shall be liable for all costs incurred by the Owner to provide staff, Architect and Construction Manager personnel as required to make facility accessible by Contractor and perform inspections during such off hours.

4. The Owner shall not be responsible for any overtime charges incurred by the Contractor during the course of this project. Any and all costs associated with work which is performed at hours requiring the payment of such overtime by the Contractor to its workers shall be the Contractor's responsibility.

I. Construction and maintenance operations shall not produce noise in excess of 60 dba in occupied spaces or shall be scheduled for times when the building or affected building spaces are not occupied or acoustical abatement measures shall be taken.

J. The Contractor shall provide all required temporary access walkways, both interior and exterior, and the like necessary to complete its work. The Contractor shall maintain an unobstructed condition at all entrances and/or exits from present buildings. No equipment, other than equipment with rubber tires, will be allowed on any existing or new pavement, UNLESS THE CONTRACTOR HAS OBTAINED THE PRIOR APPROVAL OF THE CONSTRUCTION MANAGER AND THE PAVEMENT HAS BEEN FIRST PROTECTED WITH PLANKING OR BY OTHER MEANS APPROVED BY THE CONSTRUCTION MANAGER.

K. The Contractor and any entity for whom the Contractor is responsible shall not erect any sign on the premises of the School District without the prior written consent of the Owner, which consent may be withheld at the sole discretion of the Owner.

L. 1. Without the prior approval of the Owner, the Contractor shall not permit any workers to use any existing School District facilities, including, without limitation, lavatories, toilets, entrances and parking areas other than those designated by the Owner. Employees, vehicles, and equipment of the Contractor and of all others engaged by the Contractor for the performance of its work shall enter onto the premises of the School District for which construction work is to be performed only at those locations designated or approved by the Construction Manager. The parking for construction personnel shall be limited to the designated trailer park area only. Failure to abide by this rule will result in towing of cars at the expense of the contractor who employs the individual.

2. The Contractor shall ensure that its work, at all times, is performed in a manner that affords reasonable access to both vehicles and individuals, to the premises of the School District and all adjacent areas. The Contractors' work shall be performed, to the fullest extent possible, in such a manner that areas in and around the construction area shall be free from all debris, building materials and equipment likely to cause hazardous conditions, and do not close

or obstruct walkways, roadways or other occupied facilities or facilities to be used by the Owner. Without limitation to any other provision of the agreement between the Contractor and the Owner, the Contractor shall use its best efforts to minimize any interference with the occupancy of areas, buildings, entrances, and parking areas in and around the premises at which work is being performed. Free access to fire hydrants and standpipe connections shall be maintained at all times during construction operations, and portable fire extinguishers shall be provided by the Contractor and made conveniently available throughout the construction site.

3. The Construction Manager, in conjunction with the Owner and the Architect, shall designate locations at the site at which the Contractor, its subcontractors and employees may utilize in connection with its work. The Contractor's employees and the employees of the Contractor's Subcontractors and others engaged by the Contractor to perform its work are prohibited from trespassing or leaving any vehicle on any property not assigned by the Owner as set aside for the use of the Contractor. The Contractor's employees and the employees of the Contractor's Subcontractors and other engaged by the Contractor to perform its work are restricted to the immediate area at which work is to be performed. Only persons having official business will be admitted to the construction site. NO COMMUNICATION BETWEEN THE CONTRACTOR, ITS EMPLOYEES, SUBCONTRACTORS' EMPLOYEES, OR OTHERS ENGAGED BY THE CONTRACTOR FOR THE PERFORMANCE OF ITS WORK AND STUDENTS OR STAFF WILL BE PERMITTED.

4. The Contractor, its employees, its Subcontractors and their employees or agents, and all others engaged by the Contractor in connection with the performance of its work are required to wear photographic identification badges at all times. The Contractor shall provide such individuals with said photographic identification badges. These badges shall be worn so as to be readily and easily visible. All workers and representatives of the Contractor, its subcontractors or suppliers shall wear these badges while on school property. The information on these badges shall be as prescribed by the Owner and the Construction Manager. Each person seen without a photo identification badge (or otherwise failing to comply with this requirement in the opinion of the Owner or the Construction Manager) shall be ordered to leave school property. No warnings shall be necessary. The Contractor(s) and their subcontractor(s) employing the offending person(s) shall be solely responsible for making-up and paying for any loss of production or required progress in the Work resulting from this action (including any claims by other Contractors dependent on the work of this Contractor). All parties agree that any action taken to enforce this requirement shall not be construed by any Contractor or its subcontractors or suppliers as the basis for a claim (for either time or money) for delay to the Work or to the Contractor, its Subcontractors, or Suppliers.

5. Without limitation of any other provision of the agreement between the Owner and Contractor, the Contractor shall use its best efforts to comply with all rules and regulations promulgated by the Owner in connection with the use and occupancy of the premises of the School District. The Contractor shall immediately notify the Owner in writing if during the performance of its work, the Contractor finds compliance with any portion of such rules and regulations to be impracticable, setting forth the problems of such compliance and suggesting alternative through which the same results intended by such portion of the rules and regulations

can be achieved. The Owner may, in the Owner's sole discretion, adopt such suggestions, develop new alternatives or require compliance with the existing requirements of the rules and regulations.

M. No drinking of alcoholic beverages, smoking or use of controlled substances is permitted on the grounds. The Contractor shall insure that none of its or its Subcontractors, its employees, agents, and/or consultants report to the site impaired by alcohol or controlled substances. The Contractor bears the responsibility of determining if its, or its subcontractors, employees are in any way impaired and whether the safety of the public, the employees of other Contractors and their Subcontractors, the Owner, Architect, or Construction Manager are jeopardized. Each contractor shall provide drinking water for its own employees.

N. The Contractor's employees, representatives, agents and consultants, and all of its Subcontractors' employees, representatives, agents and consultants at the site are to refrain from using indecent language. All doing so will be removed from the site. Artwork or decoration found on vehicles belonging to Contractor or Subcontractor employees parked on or near the school property which contain indecent language or pictures shall either be covered or removed from the location.

O. The Contractor's employees, representative, agents and consultants, and all of its Subcontractors' employees, representatives, agents and consultants at the site are to wear shirts, long pants and proper footwear.

P. Each contractor shall keep the premises and surrounding area in which it is working free from accumulation of waste materials or rubbish caused by the performance of all of the work being performed on-site and in the buildings. On a daily basis at the conclusion of work on the project, each contractor shall clean the areas in which it has performed work and shall remove all waste, materials, rubbish, its tools, construction equipment, machinery and surplus materials. Each Contractor shall broom sweep all construction areas in which it has performed worked every day. The Construction Manager shall perform an inspection each afternoon to determine that the work areas of the contractors have been properly cleaned. In the event the work areas are not cleaned, the Construction Manager shall advise the offending contractor to provide cleaning as required herein. If any contractor fails to keep the site safe and clean within four (4) hours of being notified by the Construction Manager, either verbally or in writing, the Construction Manager will have the clean up work performed and back charged to the offending contractor without further notification to the Contractor. The cost of such cleaning company, together with the cost of any custodial costs of the School District, at prevailing overtime rates plus 15% will be charged to the offending contractor. Notice to field personnel shall be deemed notice to the Contractor.

Q. The Contractor shall provide ventilation of enclosed areas during construction as may be required to permit proper curing and drying out and to prevent excessive humidity, moisture and condensation. Ventilation shall be by natural or artificial means as required by conditions involved.

R. The Contractor shall be responsible for the control of chemical fumes, gases and other contaminants produced by welding, gasoline or diesel engines, roofing, paving, painting, etc. to ensure that they do not enter occupied portions of the building or air intakes.

S. The Contractor shall be responsible for ensuring that activities and materials which result in "off-gassing" of volatile organic compounds such as glues, paints, furniture, carpeting, wall covering, drapery, etc. are scheduled, cured or ventilated in accordance with manufacturers' recommendations before a space can be occupied.

T. From the commencement to the completion of the Project, the Contractor shall keep the parts of the work and the buildings free from accumulation of water no matter what the source or cause of water.

U. 1. The General Contractor shall construct temporary partitions where shown on drawings or where otherwise required for safety of the public or to prevent dust from entering occupied areas. Partitions shall be dust-proof from floor to slab or structure above (if existing condition is a drop in tile ceiling, Contractor shall remove tile and install partition to structure above). In addition to framing and sheetrock, the Contractor shall install fire resistant plastic partitions on the work area side of its work. If an access door is required, an alternating 3 layer plastic system shall be used. The door shall be a standard hollow metal door with lockset and closer. Keys shall be distributed to the Owner's other contractors, the Owner and the Architect.

2. All cutting and welding performed within an occupied building or adjacent to a window or intake vent shall be performed during off hours.

V. 1. The Contractor shall control the safe handling and storage of all welding materials, acetylene and oxygen tanks, and other equipment required for welding and cutting work at the job site. Such storage shall be in compliance with OSHA regulations.

2. Welding materials and equipment shall be removed promptly from the premises upon completion of the welding and cutting work.

W. The Contractor shall be responsible for all costs incurred by the Owner caused by false security/fire alarms set off by the Contractor. Costs shall include custodial response charges etc.

X. The Contractor shall be responsible for broken glass, and at the completion of the Work shall replace such damaged or broken glass. After damaged or broken glass has been replaced, the Contractor shall remove all labels, wash and polish both sides of all glass. In addition to general broom cleaning, the General Contractor shall perform the following final cleaning for all trades at completion of the Work:

1. Remove temporary protections;
2. Remove marks, stains, fingerprints and other soil or dirt from painted, decorated and natural finished woodwork and other Work;

3. Remove spots, plaster, soil and paint from ceramic tile, marble and other finished materials, and wash or wipe clean;
4. Clean fixtures, cabinet work and equipment, removing stains, paint, dirt and dust, and leave same in undamaged, new condition;
5. Clean aluminum in accordance with recommendations of the manufacturer; and
6. Clean all floors thoroughly in accordance with recommendations of the manufacturer.

Y. Where a contractor other than the General Contractor is the only contractor engaged to perform work, the responsibilities allocated to the General Contractor in these General Conditions shall be performed by such other contractor.

## **ARTICLE 5 SUBCONTRACTORS**

A. 1. As soon as practicable after receipt of Letter of Intent to Award, Notice to Proceed or other form of official notice of award of the Contract, but not more than ten (10) days after receipt of official notice of award of the Contract, the Contractor shall furnish the Owner and the Architect, in writing, with (1) the name, trade and subcontract amount for each Subcontractor and (2) the names of all persons or entities proposed as manufacturers of the products identified in the Specifications (including those who are to furnish materials or equipment fabricated to a special design) and, where applicable, the name of the installing Subcontractor. Copies of all Subcontractor contracts, fully executed, are to be provided to the Construction Manager, including but not limited to all addenda, appendices, and/or exhibits including scope of work sheets. All such subcontracts shall be submitted to the Construction Manager within ten (10) days of the Owner's award of the contract to the Contractor.

2. Upon review of the Contractor's list of Subcontractors, the Architect will advise the Contractor in writing stating whether or not the Owner, the Construction Manager or the Architect, after due investigation, accepts or rejects, any proposed Subcontractor. Subcontractors will not be acceptable unless, when requested by the Architect, evidence is furnished that the proposed subcontractor has satisfactorily completed similar subcontracts as contemplated under this prime contract, and has the necessary experience, personnel, equipment, plant, and financial ability to complete the subcontract in accordance with the intent to the Documents. As verification of financial ability, the Owner reserves the right to request and receive up to five (5) years worth of financial statements, bank references, bond/insurance company references and all other information required to assess financial ability.

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 and Architect have no objection. No increase in the Contract Sum shall be allowed where a sub-contractor is rejected by the Architect, Construction Manager or Owner who is (1) deemed unqualified to perform the particular work subcontracted by the Contractor, (2) does not have the necessary experience, personnel, equipment, plant and financial ability to complete the subcontract, or (3) has a history of poor performance in work of similar

nature. Upon receipt of a rejection of a subcontractor by the Architect, the Contractor shall have the right to request a meeting with the Architect, Construction Manager and the Owner to discuss the reasons it believes the subcontractor is qualified to perform the work. Upon review of such reasons, the Architect shall re-consider its determination and shall advise the Contractor of its determination upon such review. If the Architect still finds that such subcontractor does not meet the requirements above-stated, it shall advise the Contractor. The Architect's determination upon such review shall be final and binding on the Contractor and its Subcontractor and the Contractor hereby waives any and all claims it or its subcontractor might have against the Owner, the Construction Manager and/or the Architect concerning the rejection of such Contractor and shall require its subcontractors to execute such similar waiver in its agreement with the Contractor.

4. The Contractor shall not change a Subcontractor, person or entity previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such change.

B. By appropriate agreement, the Contractor shall require each Subcontractor to be bound to the Contractor by terms of the Contractor's agreement with the Owner, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by said agreement, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contractor's agreement with the Owner so that subcontracting thereof will not prejudice such rights, and shall allow 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 its agreement with the Owner, has against the Owner. However, the Subcontract agreement between the Contractor and Subcontractor shall not provide, nor shall this Agreement be deemed to provide any rights, remedies or redress by the Subcontractor(s) against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors.

C. The Contractor shall promptly notify the Owner, Construction Manager and Architect of any material defaults by any Subcontractors and/or whether it has terminated its agreement with any of its subcontractors for any reason.

D. The Contractor hereby assigns all of its rights in its agreements with its Subcontractor(s) and hereby does assign, transfer and set over to the Owner all of its rights and/or interests in its agreements with its Subcontractor(s), but only in the event of termination of the Contractor's agreement with the Owner pursuant to Article 17, paragraph A of these General Conditions of the Contract for Construction and only to the extent the Owner implements its rights to take such assignment of contract by notifying the Subcontractor in writing of its intention to do so. Such an assignment is subject to the prior rights of the surety, if any, obligated to the Owner pursuant to a performance bond submitted in connection with the Contractor's work.

E. If the Work in connection with a subcontract has been suspended for more than ninety (90) days after termination of the Contract by the Owner and the Owner accepts assignment of

such subcontract, the Subcontractor's compensation shall not be adjusted for any increase in direct costs incurred by such Subcontractor as a result of the suspension.

F. It shall be the Contractor's responsibility, when sub-contracting any portion of his work, to arrange or group items of work under particular trades to conform with then prevailing customs of the trade, regardless of the particular Divisions and Sections of the Specifications in which the work is described.

G. All subcontracts must be in writing.

## ARTICLE 6 CONTRACTOR'S USE OF DRAWINGS/SPECIFICATIONS

A. The Agreement between the Owner and Contractor, and all documents incorporated therein by reference, including but not limited to, the drawings and project manual shall be signed by the Contractor and the Owner.

B. The intent of the agreement between the Owner and the Contractor is to include all items necessary for the proper execution and completion of the work to be performed by the Contractor. The documents comprising the agreement between the Contractor and the Owner are complementary, and what is required by one shall be as binding as if required by all.

C. 1. In the event of inconsistencies within or between parts of the agreement between the Contractor and the Owner or between the agreement between the Contractor and the Owner and applicable standards, codes and ordinances, the Contractor shall (a) provide the better quality or greater quantity of Work or (b) comply with the more stringent requirement; either or both in accordance with the Architect's interpretation.

2. On the Drawings, given dimensions shall take precedence over scaled measurements and large scale drawings over small scale drawings.

3. Before ordering any materials or performing any of its work, the Contractor and each Subcontractor shall verify measurements at the Project site and shall be responsible for the correctness of such measurements. No extra charge or compensation will be allowed on account of differences between actual dimensions and the dimensions indicated on the Drawings. Any difference which may be found shall be submitted to the Architect for resolution before proceeding with the performance of the work.

4. If a minor change in the Work is found necessary due to actual field conditions, the Contractor shall submit detailed drawings of such departure for the approval by the Architect before making the change.

5. Drawings, in general, are made to scale, but all working dimensions shall be taken from the figured dimensions or by actual measurements at the job and in no case by scaling. The Contractor shall study and compare all Drawings and verify all figures before laying out or

constructing the work and shall be responsible for any and all errors in his work which might have been avoided thereby. Whether or not an error is believed to exist, deviation from the Drawings and the dimensions given thereon shall be made only after approval in writing is obtained from the Architect.

6. In the event addendum (a) are issued and contain changes to the Drawings and/or Specifications, the provisions in the addendum (a) supersede previously issued Drawings and/or Specifications.

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

E. Unless otherwise stated in the agreement, words and abbreviations which have well-known technical or construction industry meanings are used in the agreements in accordance with such recognized meanings.

F. The Contractor, and all Subcontractors, shall refer to all of the Drawings, including those showing the work of others performing work in connection with the project, including but not limited to the General Contractor (if any), the Plumbing Contractor, the Heating, Ventilation, Air Conditioning Contractor, Electrical Contractor and other specialized trades, and to all of the Divisions of the Project Manual, and shall perform all work reasonably inferable therefrom as being necessary to produce the indicated results.

G. All indications or notations on the drawings which apply to one of a number of similar situations, materials or processes shall be deemed to apply to all such situations, materials or processes wherever they appear in the Work, except where a contrary result is clearly indicated by the drawings or project manual. All work mentioned or indicated in the drawings or project manual shall be performed by the Contractor unless it is specifically indicated therein that the work is to be performed by others.

H. The Drawings, Specifications and other documents prepared by the Architect are instruments of the Architect's service through which the Contractor's work is to be performed. The Contractor may retain one contract record set during the course of the project. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect, and unless otherwise indicated the Architect shall be deemed the author of them and will retain all common law, statutory and other reserved rights, in addition to the copyright. All copies of them, except the Contractor's record set, shall be returned or suitably accounted for to the Architect, on request, upon completion of the Work.

I. The Drawings, Specifications and other documents prepared by the Architect, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects without the specific written consent of the Owner and Architect. The

Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect appropriate to and for use in the performance of its work pursuant to its agreement with the Owner. All copies made under this license shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect. 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's copyright or other reserved rights.

J. The Owner shall furnish surveys describing physical characteristics of the site, upon written request of the Contractor and to the extent such survey is in existence at the time of said request, legal limitations and utility locations for the project sites. Nothing herein shall be construed as requiring the Owner to generate any document which it does not possess at the time of the request by the Contractor. In the event that the survey provided does not clearly delineate the metes and bounds of the Owner's property, the Contractor shall stop work and immediately notify the Architect, Construction Manager and the Owner. The Contractor shall NOT proceed with its work until it receives written permission from the Construction Manager and/or the Architect. The Contractor shall be fully responsible for all costs arising from non-compliance with this provision. Any delays associated with this provision shall not serve as a basis for a claim by the Contractor.

K. From the basic data established by the Owner, the General Contractor shall establish reference control points and complete the layout of the work. Each Contractor is responsible for utility markouts as it pertains to the scope of their work and maintain markout during work. Sketch of layout with reference points to be given to Construction Manager and Architect at the time of markout.

L. The Contractor shall be responsible for all measurements that may be required for execution of the work to the exact position and elevation as prescribed in the specifications, shown on the drawings, or as the same may be modified at the direction of the Architect to meet changed conditions.

M. The General Contractor shall be responsible for the establishment of points, wall and partition lines required by the various Prime Contractors and subcontractors in laying out their work.

N. Each Contractor shall furnish such stakes and other required equipment, tools and materials, and all labor as may be required in laying out any part of the work from the base lines and bench marks established by the Owner.

O. 1. The General Construction Contractor shall establish a baseline and benchmark system for each building addition, area of renovation or component using the services of a licensed professional surveyor. The surveyor(s) employed to establish this system or to extend and maintain an existing benchmark system for the work of other trades shall have not less than five years of experience in performing construction surveys similar to the work they will perform

for this project. The remaining Contractors and their respective subcontractors shall be responsible for extending these lines, levels and grades, and for performing all layout for their own work. The Contractor is solely responsible for any damage or loss due to incorrect extension of lines, level or grades in their layout. The Contractor and its subcontractors shall be responsible for the accuracy with respect to the layout of their work. Any discrepancies or errors in the drawings, perceived by another contractor or subcontractor shall be immediately reported to the Construction Manager. If any corrections are necessary, they shall be executed in accordance with the terms and provisions of these General Conditions.

2. The Contractor and its subcontractors shall be responsible to offset or to protect their markings from anything that may disturb them.

3. Every contractor shall work off the lines and elevations established and maintained as the baseline and benchmark system.

4. Each Contractor is responsible for the accuracy of his own work.

P. The Architect may require that construction work be suspended at any time when location and limit marks established by the Contractor are not reasonably adequate to permit checking completed work or the work in progress.

Q. Except for the basic building permit, the Contractor shall be responsible for securing and maintaining for the life of the project: all permits, P.E. Licenses, connection fees, inspections, etc. applicable to, or customarily secured for the work. This provision includes any permits to be issued in the name of the Contractor required for the work. Originals of all permits are to be issued in the name of the Contractor as required for the work. The Contractor shall furnish the Construction Manager with original copies of all permits prior to the commencement of the work, and shall prominently display a copy of all permits at a location approved by the Construction Manager.

R. 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 activities. Errors, inconsistencies or omissions discovered shall be reported to the Architect at once.

S. The exactness of grades, elevations, dimensions, or locations given on any Drawings issued by the Architect, or the work installed by other contracts, is not guaranteed by the Architect or the Owner. The Contractor shall, therefore, satisfy itself as to the accuracy of all grades, elevations, dimensions, utilities and locations. In all cases of interconnection of its Work with existing or other work, it shall verify at the site all dimensions relating to such existing or other work. Any errors due to the Contractor's failure to so verify all such grades, elevations, locations or dimensions shall be promptly rectified by the Contractor without any additional cost to the Owner.

T. 1. The Contractor shall give the Architect timely notice of any additional design drawings, specifications, or instructions required to define its work in greater detail, or to permit the proper progress of its work. To the extent the Architect advises the Contractor that the existing design drawings, specifications and/or instructions given are sufficiently detailed for the Contractor to perform its work, the Architect shall be under no obligation to further clarify or define the work to be performed. In all other circumstances, the Architect shall issue a field order which responds to the request for information.

2. Requests for Information (RFIs) are for requests on clarifications or questions on contract drawings and specifications, not contract terms, scheduling items, or general correspondence, nor, as a means to describe or request approval of alternate construction means, methods or concepts or substitution or materials, systems means and methods. The Contractor shall fill all RFIs out in accordance with the provisions of the Project Manual. Neither the Architect nor the Construction Manager shall fill said forms out on the Contractor's behalf.

U. The Contractor shall, prior to the start of any portion of the Work:

1. review any specified construction or installation procedures, including those as may be recommended by the proposed manufacturer.
2. advise the Architect if the specified procedure(s) deviates from good construction practice.
3. advise the Architect if following said procedure(s) will affect any warranty, including the contractor's general warranty.
4. advise the Architect of any objections the Contractor may have to the specified procedure(s).
5. propose any alternative procedure(s) which the Contractor will warrant.

V. 1. To the fullest extent possible, the Contractor shall provide products of the same kind, from a single source. When two or more items of same material or equipment are required (pumps, valves, air conditioning units, etc.), they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flanged and grooved types), sheet metal, wire, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in the work, except as otherwise indicated. The Contractor shall provide products which are compatible within systems and other connected items. If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

2. The Contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

3. With respect to sitework materials, all products submitted for use and incorporated into this project shall be on the Approved List of Materials and Equipment published by the NYSDOT Materials Bureau, most recent edition.

4. All products submitted for use and incorporated into this project shall be asbestos free.

W. Equivalents. In the Specifications, one 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, and prior to award of contract, what kind, type, brand or manufacturer is included in the base bid for the specified item. The Contractor shall follow the submission requirements for substitutions as set forth in Article 6.X below.

X. 1. Substitutions. If the Contractor desires to substitute any kind, type, brand, or manufacturer of material other than those named in the Specifications, the Contractor shall indicate the desired substitution in its bid, including the following:

a. For which specified material or equipment the request for substitution is being made;

b. What kind, type, brand, or manufacturer is sought to be substituted for the specified items;

c. Written documentation evidencing that the substituted material or equipment meets or exceeds the specifications for materials and/or equipment set forth in the project manual. Such documentation shall include, but not limited to, a full explanation of the proposed substitution, together with a submittal of all supporting data including technical information, catalog cuts, warranties, test results, installation instructions, operating procedures, significant qualities of proposed substitution (e.g. performance, weight, size, durability and visual effects), and other like information necessary for a complete evaluation of the substitution. Additionally, the Contractor shall provide material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated. All such data shall be provided to the Architect and Owner at the Contractor's sole expense. The Contractor's written explanation shall also include a list of reasons the substitution is advantageous and necessary, including the benefits to the Owner and the project in the event the substitution is acceptable. Additionally, the Contractor shall submit to the Architect information

describing in specific detail how the proposed substituted product differs from the quality and performance required by the base specifications, and such other information as may be required by the Owner or the Architect.

d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.

e. Samples, where applicable or requested.

f. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.

g. Detailed comparison of the difference in cost between the specified product and the proposed substitution including any and all costs associated with changes or modifications needed to other parts of the work and to construction performed by the Owner and/or separate Contractors that will be necessary to accommodate proposed substitution. In the event the substitution is accepted, the Contractor proposing the use of the substitution shall bear all costs associated with said changes or modifications.

2. By making said requests in conformance with procedures established herein and elsewhere in the Project Manual, the Contractor:

a. Represents that a representative of it has personally investigated the proposed substitute product and has determined that it is equal to or superior in all respects to that specified.

b. Represents that the warranty for the substitution will be the same, or greater than, that applicable to the specified product.

c. Certifies that the cost data is complete and includes all related costs under this contract, including professional services necessary and/or required for the architect and engineers to implement said substitution and waives any and all claims for additional costs related to the substitution which subsequently become apparent.

d. Represents that it will coordinate the installation of the accepted substitute, making all such changes to the drawings effected by the change, including but not limited to the electrical, plumbing, site work and heating and ventilating specifications as may be required for the work to be complete in all respects.

e. An affidavit stating that (1) the proposed substitution conforms and meets all the requirements of the pertinent Specifications and the requirements shown on the Drawings and (2) the Contractor accepts the warranty and correction obligations in connection with the proposed substitution as if originally specified by the Architect; and the proposed substitution will have no effect on the construction schedule.

3. Proposals for substitutions shall be submitted with the Contractor's bid.

4. No substitutions will be considered or allowed without the Contractor's submittal of complete substantiating data and information as stated hereinbefore.

Y. 1. Submittal of shop drawings, product data, material safety data sheets, samples or similar submittals shall be in accordance with the provisions of the project manual.

2. The Contractor represents and warrants that all shop drawings have been prepared by persons and entities possessing expertise and experience in the trade for which the shop drawing is prepared and, if required by the Architect or applicable law, by a licensed engineer, job specific, reviewed by Contractor and stamped by the Contractor.

3. If the Contractor elects to perform its work without approvals, such work shall be at the Contractor's own risk and expense.

4. By approving and submitting shop drawings, product data, samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto and has checked and coordinated the information contained within such submittals with the requirements of its work.

5. The Contractor shall not be relieved of responsibility for deviations from requirements of its work by the Architect's approval of shop drawings, product data, samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors and/or omissions in the shop drawings, product data, samples or other of its submittals to the Architect, by the Architect's approval thereof.

6. The Architect shall review, approve, reject or take other appropriate action respecting submittals made by the Contractor as set forth in the Project Manual. The Architect shall check for conformance with information given in the drawings and project manual and the design concept expressed in the agreement between the Owner and the Contractor. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities or for substantiating instructions for installation or performance of equipment or systems designed by the Contractor, all of which remain the responsibility of the Contractor. Further, the Architect's review shall not constitute

approval of safety precautions or, unless otherwise specifically stated by the Architect, of 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. When professional certification of performance characteristics of materials, systems or equipment is required by the Contract Documents, the Architect shall be entitled to rely upon such certification to establish that the materials, systems or equipment will meet the performance criteria required by the Contract Documents.

7. Upon the Architect's rejection of the Contractor's shop drawings, product data, samples and/or other documentation submitted by the Contractor to the Architect, the Contractor shall review the rejection and re-submit such shop drawing, product data, sample and or other document in accordance with the Architect's instruction. The Contractor shall direct the Architect's specific attention in writing or on re-submitted shop drawings, product data, samples, or similar submittals, to revision which have been made, including revisions not specifically requested by the Architect. Resubmission of rejected documents shall be performed within two (2) calendar days. No claim for delay or cost shall be accepted as a result of rejected documents.

8. When professional certification of performance criteria of materials, systems or equipment is required of the Contractor, the Architect shall be entitled to rely in a reasonable and professional fashion upon the accuracy and completeness of such calculations and certifications provided, however, if the Architect, in its reasonable and professional judgment considers it advisable, the Architect shall verify the accuracy and completeness of any and all such calculations and/or certifications. In the event any and all such calculations and/or certifications are found to be inaccurate and/or incomplete by the Architect, the Contractor shall assume full responsibility and bear all costs attributable or related thereto, including, without limitation, the expense of the Architect's additional services associated with the verification of such calculations and/or certifications and the expense of the Architect's additional service made necessary by the failure of such calculations and/or certifications to be accurate or complete.

9. If the Architect is required to review the Contractor's submittal more than twice, the Contractor shall bear the cost and expense associated with such additional review as set forth in the Project Manual.

Z. The Architect will interpret and decide matters concerning performance under and requirements of the drawings and/or technical specifications on written request of the Contractor. Such interpretations may, at the Architect's option, be issued in the form of additional drawings or instructions indicating in greater detail the construction or design of the various parts of the Contractor's work. Such drawings or instructions may be forwarded by the Architect to the Contractor by field order, construction change directive or other notice to the Contractor. The Contractor shall execute the work for which it requested an interpretation in accordance with such additional drawings or instructions without additional cost or extension of its contract time. After a decision has been rendered by the Architect on a matter for which the Contractor sought the Architect's interpretation of the drawings and/or technical specifications, the Contractor shall proceed with the work as directed by the Architect. Failure to proceed with the work in

accordance with the Architect's interpretation may be used as a basis for termination of the Contractor's contract pursuant to Article 17 of these General Conditions.

AA. The Contractor shall maintain at the site one record copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record changes and selections made during construction, and in addition approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and the Construction Manager and shall be delivered to the Construction Manager for submittal to the Owner upon the completion of its work.

BB. The Contractor shall maintain at the site, and shall make available to the Owner, Construction Manager and Architect, one record copy of the Drawings (the "Record Drawings") in good order. The Record Drawings shall be prepared and updated during the prosecution of the Contractor's work. The prints for Record Drawing use will be a set of black line prints provided by the Architect to the Contractor at the start of construction. The Contractor shall maintain said set in good condition and shall use colored pencils to mark up said set with "record information" in a legible manner to show: (i) deviations from the Drawings made during construction; (ii) details in the work not previously shown; (iii) changes to existing conditions or existing conditions found to differ from those shown on any existing drawings; (iv) the actual installed position of equipment, piping, conduits, light switches, electric fixtures, circuiting, ducts, dampers, access panels, control valves, drains, openings, and stub-outs, etc.; (v) architectural and/or structural changes in the design; and (vi) such other information as either Owner or Architect may reasonably request. At the completion of the work, Contractor shall transfer all information on record drawings to reproducible drawings with new information clouded and noted. Such drawings shall be stamped with the Contractor's name and "AS-BUILT" in the lower right hand corner. The colored record drawing and the as-built reproducible drawing shall be forwarded to the Construction Manager for delivery to the Owner. Final payment and any retainage shall not be due and owing to Contractor until the Record and/or As Built drawings receive the approval from the Architect and the Owner (and all other closeout requirements are met).

CC. The Contractor shall maintain all approved permit drawings in a manner so as to make them accessible to government inspectors and other authorized agencies. All approved drawings shall be wrapped, marked and delivered to the Owner within sixty (60) days of final completion of the Contractor's work.

DD. Each Prime Contractor shall be furnished, free of charge, 3 copies of the Contract Documents and Project Manuals, including all Addenda. Any and all additional copies will be furnished to the Contractor at the cost of reproduction, postage and handling.

## **ARTICLE 7 CONTRACTOR'S SAFETY/SECURITY PROGRAM**

A. 1. The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of its work.

Prior to beginning any work, the contractor shall submit a copy of its corporate safety plan to the Owner and the Architect. Two (2) weeks after receipt of the Notice to Proceed, the Contractor shall provide a Site Safety/Logistics Plan to the Owner and the Architect. The site logistics plan should minimally include locations of the eight-foot high temporary fence and gates, traffic plans for deliveries and removals, refuse container locations, crane locations, pick locations, boom radius, and lift locations, stockpiles, toilet locations, site water and power locations, and safety. This plan shall also show the location of all staging and storage areas, clearly separating construction and school areas. The logistical information represented by the construction documents shall serve as a minimal guide. Each contractor is required to submit their corporate safety policy within ten (10) days of receipt of the Notice to Proceed. Said policy must minimally meet OSHA standards and define details concerning the maintenance of a safe work environment and shall also define practices for the maintenance of hygiene and minimizing the spread of infectious/contagious diseases. The Contractor shall make the participation of its subcontractors in its safety program mandatory. A list of key personnel, with addresses and telephone numbers for emergency purposes shall be forwarded to the Owner and the Architect. The Owner and the Architect shall establish a fire coordination procedure and shall forward same to the Contractor for its use during the performance of its work.

2. The Contractor shall provide its COVID-19 Safety Plan to the Owner prior to the start of any work. The Contractor shall designate a person on its staff to be responsible to monitor wearing of Personal Protective Equipment (PPE) by each person on site working with or for the Contractor. All Center for Disease Control guidelines and Local, State & Federal Orders must be strictly followed.

3. All laborers, workers, and mechanics employed in the performance of the work of this Project shall be certified as having successfully completed a course in construction safety and health approved by the United States Department of Labor's Occupational Safety and Health Administration that is at least ten (10) hours in duration.

The Contractor and its subcontractors shall conduct their operation in accordance with the Safety Guides for Construction as issued by the SED, and, the Contractors' Safety Program.

4. All safety equipment including hard hats and weather protective gear required for the Contractor to perform its work are to be supplied by the Contractor and/or its subcontractors. Within the designated construction areas, the Contractor's employees, superintendents, and/or other agents, and its subcontractors, employees, superintendents, and/or other agents are required to wear hard hats and other required and/or essential safety equipment. Each person seen without a hard hat, or otherwise failing to comply with this requirement, will be ordered to leave the project. No prior warnings will be given by the Owner or Construction Manager and Architect. The Contractor and its subcontractors shall be solely responsible for making up and paying for any loss of production or required progress resulting from the removal of personnel from the project as set forth herein including any costs incurred by the Owner in connection with the work of other contractors.

5. The Contractor and its subcontractors shall provide blankets and auxiliary fire protection as part of its construction safety program to prevent damage to adjacent work or materials as a result of its welding or burning operations. Additionally, as part of its construction safety program, the Contractor and its subcontractors shall provide a fire watch, with a fire extinguisher, which is acceptable to the Owner and the Construction Manager.

6. The Construction Manager and/or Owner reserve the right to have all operating equipment periodically inspected by an independent inspector whose finding will be binding. The Prime Contractor, at its own expense, must make corrections within two (2) working days of receiving a written report.

7. All flagmen required for deliveries to the site are to be furnished by the Contractor or its Subcontractors responsible for the delivery. Any and all deliveries crossing the site or student traffic areas shall be escorted by flagmen. All flagmen shall wear orange vests.

B. The Contractor shall schedule weekly safety meetings and each of its subcontractors must be properly represented at such meetings. The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. The Contractor shall notify the Construction Manager in writing its "OSHA Competent Person Regarding Safety". Said person must be an individual capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Construction Manager and Architect. The Contractor shall take all necessary steps to prevent its employees from disturbing and/or damaging the facility and shall be responsible for preventing the escape of fires set in connection with the construction. The Contractor shall notify its employees and subcontractors of the location of the nearest fire alarm box at all locations where the work is in progress. On a weekly basis, the Contractor shall submit to the Construction Manager and Architect minutes of its safety meetings, which minutes shall include a list of the individuals present at such meetings.

C. The Contractor and each of its subcontractors shall conduct its/their operation in accordance with all applicable laws, regulations and order of local, state and federal governments. The Contractor agrees, in order that the work will be completed with the greatest degree of safety to conform to the requirements of the Occupational Safety and Health Act of 1970 (OSHA) and the Construction Safety Act of 1969, including all standards and regulations that have been since or shall be promulgated by the governmental authorities which administer such acts.

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

E. The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for surety and protection, including posting

danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

F. The Contractor shall take reasonable precautions for the safety and protection of employees at the project site and other person who may be affected by its work, including but not limited to students, staff, employees and agents of the Owner, the Construction Manager and the Architect.

G. The Contractor shall protect and secure its work and the materials and/or equipment to be utilized in connection with its work, whether stored on or off the site and whether in its care, custody and control or that of its Subcontractors, subcontractors to its subcontractors, or material suppliers.

H. The Contractor shall take all steps necessary to protect all property at or adjacent to the site, including but not limited to trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

I. All delivery vehicles/trucks/machinery/etc. permitted on the site must be equipped with back-up alarms and enter through the designated access points. The Contractor's failure to demonstrate this ability will result in cancellation of delivery or stoppage of work. All delays associated with this cancellation will be the responsibility of the contractor responsible for the work involved.

J. All crane picks, materials delivery, etc. must be coordinated so as not to lift over any occupied area of the building. If absolutely necessary, this work shall be done on off hours to insure the safety of the building occupants. Crane location must approved by the Construction Manager to insure the safety of building occupants.

K. The Owner or Construction Manager reserves the right to have all hoisting equipment periodically inspected by an independent inspector whose findings will be binding. The Contractor, at its own expense, must make corrections cited by the inspector before continuing work. The Owner or Construction Manager will not assume any responsibility for the safe operation of any hoisting equipment by exercising this right. The Contractor and/or its subcontractor(s) shall cooperate with the inspector by allowing time for the inspection. The Contractor shall be notified twenty four (24) hours prior to the time of the inspection. These inspections do not release the Contractor if its responsibility to provide all engineering, permits and inspections as required by OSHA or the New York State Education Department prior to use of any hoisting equipment.

L. The Contractor shall use the entrances designated on the site logistic plans and drawings for personal vehicles, trucks, equipment, deliveries and the like.

M. All interior temporary partitions and emergency egress barriers (if required) are to be installed on an after hours basis (weekends/school holidays).

N. 1. When use or storage of hazardous materials or equipment or unusual construction methods are necessary to perform its Work, the Contractor shall obtain the Owner and the Construction Manager's consent for the use of such materials, equipment or unusual construction methods. In the event the Owner determines that the use of such hazardous material or equipment or unusual construction methods can be performed by the Contractor with alternative means, methods and/or techniques, the Contractor shall employ such alternate means of prosecuting its work at no additional cost to the Owner.

2. In the event the Owner approves the use or storage of such hazardous materials, equipment or unusual construction methods, the Contractor shall provide for the Owner's and the Construction Manager's use a full set of safety instructions relating to all such materials. Additionally, when the Owner and/or the Construction Manager reviews the use of storage of such hazardous materials, equipment and or unusual construction methods, the Contractor shall exercise the highest degree of care and carry on such activities under supervision of properly qualified personnel.

3. Transportation, storage, and use of explosives shall be in strict accordance with all local, state and federal regulations, statutes, and requirements. All safety precautions as set forth in the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, Inc. shall be observed.

4. The Contractor is responsible for its own storage and personnel trailers at the site. The Contractor will be required to supply man trailers and storage box trailers as required. All costs related to delivery, construction, protection, power, etc. for said trailers are the responsibility of the contractor utilizing the space. The Owner WILL NOT PROVIDE STORAGE SPACE. The placement of personnel and/or storage trailer will be strictly limited to pre-determined locations. The Contractor shall obtain the written approval of the placement of any trailer or storage box from the Construction Manager.

O. During construction, the General Contractor shall be responsible for maintaining a watertight structure. This shall include additions and existing buildings. The contractor shall be responsible for temporary roofing, tarps and other protection at roofs, cavity walls, etc. Should the contractor fail to provide adequate protection, causing flooding, damage or other disturbance to the existing building, contractor shall be responsible for all costs associated with clean up and repairs. Inasmuch as flooding and damage have safety implications to the general public, clean up and repairs may be made by the Owner without warning to the Contractor. Administration costs incurred by the Owner and Architect will also be back charged to the Contractor. The Contractor, by entering into contract with the Owner agrees to be liable for these costs.

P. When all or a portion of the Contractor's work is suspended for any reason, the Contractor shall securely fasten down all coverings and protect the work, as necessary, from injury by any cause.

Q. 1. The Contractor shall promptly remedy damage and loss to all property of the Owner, or adjacent to the Owner's property (other than damage or loss covered by insurance)

caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor.

2. Title to all completed or partially completed work at the job site, and to all materials delivered to and stored at said job site which are intended to become a part of the completed work covered by the agreement between the Contractor and the Owner, shall be in the name of the Owner. Notwithstanding the foregoing, and prior to acceptance of the completed work by the Owner, the Contractor shall be liable for all loss of or damage to said completed work, partially completed work, materials furnished by the Contractor, and/or materials or equipment furnished by others, the custody of which has been given to the Contractor, arising from any cause other than those against which the Owner herein undertakes to carry insurance. In the event of loss or damage from cause other than those against which the Owner undertakes to carry insurance, the Contractor shall replace or repair the said work or materials at his own cost and expense, to the complete satisfaction of the Owner, the Construction Manager and the Architect.

R. The Contractor shall promptly report in writing to the Owner, the Architect and the Construction Manager all accidents arising out of or in connection with the Work which cause death, person injury, or property damage, giving full details and statements or any witnesses. In addition, if death, serious personal injuries, or serious property damages are caused, the accident shall be reported immediately by telephone or messenger to the Owner, Construction Manager and the Architect.

S. 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.

T. Any and all fines or citations levied against the Owner, Architect, or Construction Manager due to the failure of the Contractor to comply with regulations of any governing authority, shall be paid for by the Contractor. This shall include any interest or late charges which accrue due to the Contractor's failure to remit payment upon receipt of such levies.

U. The Contractor shall indemnify and hold harmless the Owner, Construction Manager and Architect from any and all claims, damages, losses, suits, obligations, fines, penalties, costs, charges and expenses which may be imposed upon or incurred by or asserted against any of them by reason of any act or omission of such Contractor or any subcontractor or any person or firm directly or indirectly or indirectly employed by such Contractor, with respect to violations of OSHA requirements, rules and/or regulations.

V. The Contractor acknowledges that the Labor Law of the State of New York, and regulations adopted thereunder, place upon both the Owner and Contractor certain duties and that liability for failure to comply therewith is imposed on both the Owner and Contractor regardless of their respective fault. The Contractor hereby agrees that, as between the Owner and

the Contractor, and to the extent permitted by law, the Contractor is solely responsible for compliance with all such laws and regulations imposed for the protection of persons performing the Contract.

W. The Contractor shall indemnify and hold harmless the Owner, Architect, and Construction Manager, of and from any and all liability for violation of such laws and regulations and shall defend any claims or actions which may be brought against the Owner as the result thereof. In the event that the Contractor shall fail to refuse to defend any such action, the Contractor shall be liable to the Owner for all costs of the Owner, Architect or Construction Manager in defending such claim or action and all costs of the Owner, including attorney's fees, in recovering such defense costs from the Contractor.

X. The Contractor and its subcontractors shall indemnify and hold harmless the Owner, Construction Manager and Architect from any and all claims, damages, losses, suits, obligations, fines, penalties, costs, charges and expenses which may be imposed upon or incurred by or asserted against any of them by reason of any act or omission of such Contractor or any subcontractor or any person or firm directly or indirectly employed by such Contractor, for the act and/or omissions of any Contractor or Subcontractor that resulted in an incident and/or accident causing personal injury and/or property damage.

Y. The Construction Manager, the Owner, and/or the Architect will not assume any responsibility for the safe operation of any cranes or equipment by exercising this right. The Contractor and its subcontractors shall cooperate with the inspector by allowing time for inspection. The Contractor will be notified 24 hours prior to the time of the actual inspection. The Contractor is obligated to perform all engineering, obtain permits, and to have all hoisting equipment inspected as required by OSHA, Village, Town, County, State, and Federal regulations as well as any other agency having jurisdiction. Copies of all inspection reports and certificates must be transmitted to Construction Manager as soon as possible.

## **ARTICLE 8 CHANGES IN THE WORK**

A. Without invalidating the agreement between the Owner and the Contractor, and without notice to the Contractor's surety, the Owner may, at any time or from time to time, order additions, deletions or revisions in the Contractor's work. Such additions, deletions or revisions will be authorized by field order, change order, or construction change directive.

B. Field Orders are an interpretation of the contract drawings and/or specifications which order minor changes in the Contractor's work which will not result in an increase or decrease in the Contractor's total contract sum. From time to time, the Architect may issue field orders to the Contractor. The work included in such field order shall be performed by the Contractor at no additional cost to the Owner and shall not form the basis for a claim for an extension of time of the Contractor's time to complete its work. Hence, the Contractor shall perform the work included in field orders so as to cause no delay to its work and/or the work of other contractors engaged by the Owner in connection with the project. All field orders shall be given to the

Contractor and the Construction Manager by the Architect in writing.

C. 1. When the Owner or Architect (in association with the Construction Manager) request that the Contractor perform work which is not included in the contract drawings or specifications and which will result in additional cost to the Owner, the Architect/Construction Manager shall issue a PCO Number and shall request that the Contractor submit its proposal for performing such additional work. The Contractor shall submit its proposal to the Construction Manager and Architect for review. The Contractor's proposal shall include a complete itemization of the costs associated with performing its work including labor and materials. All proposals for any work that a Contractor, its subcontractor(s) or subcontractor(s) of subcontractor(s) perform in connection with additional work shall be submitted using the following format and in no event shall the total for overhead and profit on any change order exceed fifteen percent (15%) of the cost of the work.

1.	Materials (Itemized Breakdown) including quantities and cost	
2.	Labor (Itemized Breakdown)	
3.	Subtotal (Add lines 1 and 2)	
4.	Credit for work not required due to additional or changes to the work reflected in the within change order (if any)	
5.	Overhead (10% x line 3)	
6.	Subtotal (Add lines 3 through 5)	
7.	Sub-Contract Work (Include itemized breakdown. Sub-Contractor(s) overhead and profit allowed is 10%)	
8.	Subtotal (Add lines 6 and 7)	
9.	Profit (5% x line 8)	
10.	Subtotal (Add lines 8 and 9)	
11.	Rental Value of Equipment (Itemized Breakdown)	
12.	Actual additional charges for bonds	
13.	TOTAL CHANGE ORDER (Add lines 10, 11 and 12)	

2. All proposals submitted by the Contractor without the itemization indicated herein will be returned to the Contractor for re-submission by the Contractor. For any work performed by the Contractor's own forces, fifteen percent (15%) for overhead and profit will be allowed for labor and material related costs. Costs to which overhead is to be applied shall be limited to cost of labor and materials including the cost of delivery. Under no circumstances shall any change order proposal exceed fifteen percent (15%) of the cost of overhead and profit.

The Contractor shall not be entitled to recover overhead and profit on the rental value of equipment and machinery. "Equipment and machinery" shall not include (1) tools customarily used by the contractor's trade, including but not limited to hand tools, and/or (2) equipment and machinery already on site and being utilized by the Contractor for the original scope of work.

The Contractor shall submit with its change order proposals actual invoices from its insurance

broker reflecting actual additional costs associated with the procurement of bonds.

3. The Contractor's subcontractor's proposal for any work it is to perform in connection with the additional work shall only include ten percent (10%) for the subcontractor's overhead and profit including sub-subcontracted work. The Contractor is entitled to five percent (5%) on work performed by its subcontractor in accordance with paragraph C (1) of this Article 8. Costs to which overhead is to be applied shall be limited to cost of labor and materials including the cost of delivery. Under no circumstances shall the Contractor or the Contractor's subcontractor(s) be entitled to be reimbursed for overtime, except when specifically approved by the Owner in writing and not as an Extraordinary Measure as set forth in Article 13, and in such event the Contractor shall be paid for by the Owner on the basis of premium payment.

4. Notwithstanding the foregoing, work which is performed pursuant to an allowance included in the Contractor's base contract, the provisions of Article 9, paragraph B, concerning itemization of such work shall be controlling.

5. a. A change in the Contract Sum shall be accomplished only by a written Change Order. Accordingly, no course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work, whether or not there is, in fact, any unjust enrichment to the Work, shall be the basis of any claim as defined in Article 18 of these General Conditions to an increase in any amounts due under the Contract Documents or a change in any time period provided for in the Contract Documents. **No amount shall be payable by the Owner to the Contractor for performance of work without a written and fully executed Change Order.**

b. Upon the Contractor's completion of the change order work, and prior to payment being made to the Contractor for such work, the Contractor shall provide the Owner with the following information:

1. Certified payrolls itemizing the labor actually utilized in connection with the change order work.
2. Copies of invoices from subcontractors supplying work in connection with the change order work.

D. 1. When the Owner or Architect request that portions of the Contractor's work originally included in the contract drawings or specifications be deleted and which will result in a reduction of the Contractor's original contract sum, the Architect shall request that the Contractor submit its proposal for deleting the scope of such work from its contract. The Contractor's proposal shall include a complete itemization of the costs associated with deducting such work including labor and materials and shall be submitted using the format set forth in Article 8, paragraph C(1) of these General Conditions of the Contract for Construction or the schedule of values, whichever is greater. The Contractor shall not be entitled to retain its overhead and/or profit for such work nor shall any of its subcontractors which were to perform the work being deducted from the Contractor's scope of work. Additionally, the Contractor shall

reflect the reduced cost of premiums on bonds which are to be supplied herein as a result of such change. 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/decrease with respect to that change.

2. The Owner may in its sole discretion deduct and/or reduce the scope of the Contractor's contract with or without any specific reasons therefor.

E. 1. In the event the Contractor and the Owner cannot agree on the sum by which its contract with the Owner is to be increased or reduced based upon changes to the scope of the work as described in Article 8, the Architect shall issue a construction change directive reflecting the deduction and/or reduction of the scope of the Contractor's contract and the Contractor will (a) in the case of additional work to be performed by the Contractor, perform such additional work in an expeditious manner so as not to delay the work of this or other contractors working at the site, and (b) in the case of work to be deducted from the scope of the Contractor's work, refrain from taking any steps in connection with the work associated with the deduction and/or reduction of the scope of the Contractor's work. The construction change directive shall include (a) a description of the work being added or deducted from the Contractor's scope of work; (b) the amount the Owner has determined to be the cost associated with the additional work or deduction and/or reduction of the scope of the Contractor's contract until the Owner and the Contractor agree upon the increase or decrease in the Contractor's contract sum, or until a claim filed by the Contractor has been determined; (c) the extent to which the contract time will be adjusted as a result of the change in the scope of work. Any claims must be filed in accordance with the requirements set forth in Article 18 of these General Conditions. Failure to timely file any claim in accordance with requirements set forth therein shall constitute a waiver of such claim.

2. In the event the Contractor and the Owner reach agreement on the amount by which the Contractor's contract sum is to be increased or decreased based upon changes to the scope of the Contractor's work as described in Article 8, the Architect, Owner, Construction Manager and Contractor shall sign a change order reflecting such agreement. The change order shall include (a) the description of the change in the scope of the Contractor's work; (b) the amount of the adjustment to the Contractor's contract sum, if any; and (c) the length of time by which the time to complete the contract will be adjusted, if any. Agreement between the Owner and the Contractor in connection with any change order shall constitute a final settlement of all matters relating to the change in the Contractor's work as reflected in said change order, including but not limited to, all direct and indirect costs associated with such change and any and all adjustments to the Contractor's contract sum and the construction schedule. All such change orders for which the Owner and the Contractor have reached agreement shall be included as a separate line item in the Contractor's applications for payment as if originally part of the Contractor's agreement with the Owner.

F. Neither the Owner, the Construction Manager nor Architect may issue instructions to the Contractor to change the amount of the Contract, except by properly executed Change Orders. Instructions are issued by the Owner or the Construction Manager through the Architect, to the

Contractor. The instructions shall not be carried out by the Contractor prior to a written order in the form of a Change Order, signed by the Owner, Architect and Contractor, authorizing a change in the Contract amount or an adjustment to the Contract Sum. No amount shall be payable by the Owner to the Contractor for performance of work without an executed Change Order.

## **ARTICLE 9 PAYMENTS**

A. 1. Prior to commencing its work on the project and within one (1) week of receipt of a Notice to Proceed, the Contractor shall submit to the Construction Manager and the Architect, a schedule of values which includes the amount of money it has allocated in its bid price for the following items of work which are applicable to the Contractor's work. Said schedule of values shall include each of the CSI division sections reflected in the specifications and applicable to the contract for which the Contractor has been awarded the contract, together with the requirements for bonds/insurance (based upon actual invoice amount), general conditions, meeting attendance and meeting documentation (at least two (2) percent of the contract sum), shop drawing/product data/sample submissions (at least one (1) percent of contract sum), labor and materials on line items as applicable, temporary utilities and services, HVAC balance reports, coordination drawings, punchlist (at least one (1) percent of the contract sum), warranties/guarantees and close out of the project (at least three (3) percent of the contract sum), and allowance, where applicable.

2. Any schedule of values which fails to include sufficient detail, is unbalanced or exhibits "front loading" of the value of the Contractor's work will be rejected. Furthermore, if the schedule of values has been approved by the Construction Manager and the Architect and is subsequently used, but later is found by the Construction Manager or Architect to be improper for any reason, sufficient funds shall be withheld from the Contractors' future applications for payment to ensure an adequate reserve (exclusive of normal retainage) to complete the Contractor's work.

3. The schedule of values shall be drafted so as to reflect multiple construction sites, multiple locations within each site, additions versus renovations of work, and the like so as to satisfy any New York State Education Department requirements for the project.

4. The Schedule of Values prepared by the Contractor must be approved by the Construction Manager and the Architect prior to the payment of any sums due the Contractor.

B. The Contractor shall include in its contract sum all allowances stated in the specifications. However, the Contractor's costs for unloading and handling at the site, overhead, profit and other expenses contemplated for the stated allowance amounts shall be included in its contract sum and not in the allowances.

C. The Contractor shall submit its applications for payment to the Construction Manager and the Architect on a periodic basis. The form to be used by the Contractor shall be AIA G732 and 703/CMa approved by the Construction Manager, the Architect and the Owner for use in

connection with the Contractor's work. The form shall be divided in sufficiently in the same form as the Contractor's schedule of values and shall reflect in separate line items for the work:

1. Total value of the work listing labor and material separately
2. Percentage of work completed at the time of submission of the application for payment
3. Value of the work completed at the time of submission of the application for payment
4. Percent of previous amount billed
5. Previous amount billed
6. Current percent completed;
7. Value of work completed to date
8. Percent remaining to be completed by the Contractor; and
9. Value of work remaining to be completed by the Contractor

D. 1. Payments to the Contractor shall be based upon materials and equipment delivered and suitably stored at the site and/or incorporated into the Contractor's work, together with the labor utilized by the Contractor in connection with its work. The Contractor may be paid for materials and/or equipment which has been delivered to the Owner's facilities but which, at the time of submission of its application for payment, has not yet been incorporated into the Contractor's work upon such conditions and requirements as the Owner, the Construction Manager and/or the Architect may advise the Contractor it must satisfy.

2. The Construction Manager and Architect shall review the application for payment submitted by the Contractor and shall advise the Contractor of any adjustments to be made thereto. The Construction Manager and/or the Architect may make such adjustments under the following circumstances:

- a. the Contractor's failure to remedy defective work;
- b. the filing of third party claims or reasonable evidence that there is a probability that such claims will be filed;
- c. receipt by the Owner of a notice of withholding from the New York State Department of Labor or other administrative agencies having jurisdiction over the project;
- d. the Contractor's failure to make proper payments to its subcontractors or material suppliers for labor, materials and/or equipment;
- e. reasonable evidence that the Contractor will not complete its work for the unpaid balance of the remaining monies on its contract;
- f. damages caused to the Owner, Construction Manager, the Architect or another contractor as a result of the Contractor's performance of its work;

- g. reasonable evidence that the Contractor will not complete its work in accordance with its agreement with the Owner, and/or that the remaining monies available on the Contractor's contract will not be sufficient to cover actual or liquidated damages for the anticipated delay;
- h. the Contractor's failure to carry out its work in accordance with the contract drawings and/or specifications;
- i. the Contractor's failure to notify the Architect of errors or inconsistencies between and among the contract drawings and specifications;
- j. the Contractor's and/or its subcontractors' failure to comply with the requirements for maintaining record drawings;
- k. the Architect's and/or the Construction Manager's discovery or observation of work which has been previously paid for by the Owner which is defective and/or incomplete;
- l. such other acts and/or omissions by the Contractor in connection with the performance of its work.
- m. The amount requested exceeds the percent completion of work on the site.

3. After any such adjustments are made to the Contractor's application for payment, the Contractor shall submit four (4) copies of the final draft of its application for payment to the Construction Manager and Architect, which shall be accompanied by the following documentation:

- a. A current Contractor's lien waiver and duly executed and acknowledged sworn statement showing all Subcontractors and material suppliers with whom the Contractor has entered into subcontracts, the amount of each such subcontract, the amount requested for any Subcontractor and material suppliers in the requested progress payment and the amount to be paid to the Contractor from such progress payment, together with similar sworn statements from all such Subcontractors and material suppliers;
- b. Duly executed waivers of public improvement liens from all Subcontractors and material suppliers and lower tiered Subcontractors or material suppliers establishing payment or satisfaction of payment of all amounts requested by the Contractor on behalf of such entities or persons in any previous Application for Payment; and AIA Form G706 or G706A.
- c. Certified payroll for employees of the Contractor and employees of subcontractors performing work on the Project.

- d. Copies of invoices submitted to the Contractor by its subcontractors and/or material suppliers.
  - e. Such other information which the Owner, Construction Manager and/or the Architect request the Contractor furnish in connection with its application for payment, including but not limited to, contractor change order log, contractor submittal log and as built drawings to date.
4. Upon submission of its application for payment, the Contractor represents that it is entitled to payment in the amount for which it seeks payment.
5. In addition to the right to make adjustments to the amount the Contractor claims is due (as set forth in subparagraph 2 of this Paragraph D), the Owner may withhold payment from the Contractor and the Architect and/or Construction Manager may withhold certification for payment, if any of the reasons set forth in subparagraph 2 exist.
6. The Owner shall make payment to the Contractor within forty-five days of receipt of the Contractor's requisition of payment unless such requisition of payment is not in accordance with the terms of the Construction Documents.
7. Upon receipt of payment by the Owner, the Contractor shall promptly make payment to each of its subcontractors and/or material suppliers for which it has received payment from the Owner. This provision does not obligate the Architect, the Construction Manager and/or the Owner to ensure payment to the Contractor's subcontractors and/or material suppliers.
8. a. In the event a subcontractor and/or material supplier files with the Owner a public improvement lien, the Owner shall withhold payment on previously certified applications for payment which have not yet been paid or subsequent applications for payment submitted by the Contractor an amount equal to 150% of the amount set forth in such public improvement lien. This provision is in addition to and does not supersede the indemnity provisions set forth in Article 12 of these General Conditions.
- b. The Owner may release any payment withheld due to the filing of a public improvement lien if the Contractor obtains security acceptable to the Owner or a lien bond which is: (1) issued by a surety acceptable to the Owner, (2) in form and substance satisfactory to the Owner, and (3) in an amount not less the 150% of such lien claim. The cost of the premiums for any such bond posted shall be borne solely by the Contractor. By posting a lien bond or other acceptable security, however, the Contractor shall not be relieved of its obligations pursuant to these General Conditions,

including but not limited to the indemnity provisions set forth in Article 12 of these General Conditions.

E. 1. The Contractor shall not be entitled to payment for materials and/or equipment stored off the site unless previously approved in writing by the Owner, Architect, and/or the Construction Manager and upon the Contractor meeting any and all conditions which the Owner, the Architect and/or Construction Manager may impose in connection with such materials and/or equipment, including but not limited to insurance for such materials and cost of storage and transportation associated with such materials and/or equipment. No payment will be made for "commodity type" stored materials such as block, studs, sheetrock, roofing, insulation, piping, fittings, conduit work, etc.

2. In connection with materials and/or equipment stored off the project site, the Contractor must submit with its application for payment the following information:

- a. Type of material must be specifically identified by the Contractor;
- b. The Contractor must furnish an invoice from its supplier showing the total value of material and/or equipment being stored off site and must provide the bill of lading for such material and/or equipment;
- c. The Contractor must provide a Certificate of Insurance in a form approved by the Owner for the full value of the item plus 10%.
- d. The Contractor must execute a security agreement, together with an executed UCC-1 form;
- e. The materials must be stored in a bonded warehouse;
- f. The Contractor must furnish a bill of sale for stored material and/or equipment;

Contractor still has liability for all materials whether paid or not until installed.

3. Any and all materials and/or equipment for which the Contractor has been paid shall be titled in the Owner upon installation by the Contractor and shall be stored in a bonded facility. For payment to be made to the Contractor, the Contractor must provide the Owner with a waiver of lien and general release from its supplier in connection with its provisions of such materials and/or equipment. Notwithstanding payment by the Owner, any and all warranties and/or guarantees required by this agreement shall not begin to run until the Contractor has completed all of its work.

4. Prior to payment by the Owner, the Contractor may be required to provide the Architect and the Construction Manager with an opportunity to visually inspect the materials

and/or equipment for the purpose of determining that such materials are in fact in storage, are the materials specified for the Contractor's work and for any other purpose which the Owner, Construction Manager and/or Architect deem necessary for payment to be made to the Contractor.

F. If the Owner is entitled to reimbursement or payment from the Contractor under or pursuant to its agreement with the Owner, including but not limited to these General Conditions of the Contract for Construction, such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained herein to the contrary, if the Contractor fails to promptly make any payment due the Owner, or the Owner incurs any costs and expenses to cure any default of the Contractor or to correct defective work, the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to: (1) deduct an amount equal to that which the Owner is entitled from any payment then or thereafter due the Contractor from the Owner, or (2) issue a written notice to the Contractor reducing the Contractor's contract sum by an amount equal to that which the Owner is entitled.

G. The Contractor may not assign any monies due or to become due to it pursuant to its agreement with the Owner without the Owner's written consent. Any such assignment shall be in a form acceptable to the Owner. If the Contractor attempts to make such an assignment without such consent from the Owner, the Contractor shall nevertheless remain legally responsible for all obligations under its agreement with the Owner.

H. Progress payments and all other payments shall be made in accordance with Section 106 (b) of the General Municipal Law.

I. At the same time the Contractor submits its insurance certificate to the Owner and the Construction Manager, it shall also submit to the Construction Manager the labor rates of each category of labor for which it and/or its subcontractors shall employ (either directly or indirectly).

This information shall be itemized in the format shown below:

***THE REST OF THIS PAGE INTENTIONALLY LEFT BLANK***

Contractor's Name					
Contractor's Address					
Contractor's Office Phone					
Contractor's Fax Number					
Contractor's Email Address					
Labor Rate Breakdown					
Worker's Title		Journeyman	1.5 Rate	Foreman	1.5 Rate
Base Hourly Rate					
<b>Payroll Tax &amp; Insurance:</b>	<b>\$ Per Hr.</b>				
FICA					
Federal Unemployment					
State					
Workers Compensation					
Disability					
Other (Explanation Required)					
<b>Subtotal</b>					
<b>Benefits:</b>	<b>\$ Per Hr</b>				
Vacation					
Health & Welfare					
Pension					
Annuity					
401K Fund					
Other (Explanation Required)					
Other Explanation Required)					
<b>Subtotal</b>					
<b>Hourly Labor Rate</b>					

**ARTICLE 10  
INSURANCE REQUIREMENTS**

A. Within ten (10) days of the award of the bid, the Contractor, at its sole cost and expense, shall provide the Owner with the following insurance coverage whether the operations to be

covered thereby are through 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. Workers' Compensation and Disability:

Coverage	Statutory
Extensions	Voluntary compensation All states coverage employers Employer's liability - unlimited

2. Commercial General and Umbrella Liability

Coverage	Occurrence using ISO occurrence Form CG 00 01 07 98 or later form
Limits per project	\$1,000,000.00 per occurrence, \$2,000,000.00 general aggregate - on a per project basis  Products/Completed Operations - \$2,000,000.00  Personal & Advertising Injury - \$1,000,000.00  Fire Damage (any one fire) - \$100,000.00  Medical Expenses (any one person) - \$10,000.00

3. Owners and Contractors Protective Liability Insurance:

a. \$2,000,000 per occurrence, \$4,000,000 general aggregate for contracts greater than \$1,000,000, or any contracts involving scaffolds or work above a height of one story.

b. \$1,000,000 per occurrence, \$2,000,000 general aggregate for contracts less than or equal to \$1,000,000 that do not involve scaffolds or work above a height of one story.

Excess Liability (excess coverage shall be on a follow-form basis):

a. \$10,000,000 for contracts greater than \$1,000,000, or any contracts involving scaffolds or work above a height of one story

- b. \$5,000,000 for contracts less than or equal to \$1,000,000 that do not involve scaffolds or work above a height of one story.
- 4. Automobile Liability  
(all vehicles hired or non hired) \$1,000,000.00 per accident
- 5. If this project requires the removal of asbestos and/or hazardous materials, Contractors shall provide hazardous material liability insurance as follows:  
  
\$2,000,000 per occurrence/\$2,000,000 aggregate, including products and completed operations. Such insurance shall include coverage for the Contractor's operations including, but not limited to, removal, replacement enclosure, encapsulation and/or disposal of asbestos, or any other hazardous material, along with any related pollution events, including coverage for third-party liability claims for bodily injury, property damage and clean-up costs. If a retroactive date is used, it shall pre-date the inception of the Contract. If motor vehicles are used for transporting hazardous materials, the Contractor shall provide pollution liability broadened coverage (ISO endorsement CA 9948), as well as proof of MCS 90. Coverage shall fulfill all requirements of this Article 10 and shall extend for a period of three (3) years following acceptance by the District of the Certificate of Completion.
- 6. Testing Company Errors and Omission Insurance  
  
\$1,000,000 per occurrence/\$2,000,000 aggregate for the testing and other professional acts of the Contractor performed under the Contract with the Owner.

Notwithstanding any terms, conditions or provisions, in any other writing between the parties, Contractor hereby agrees to effectuate the naming of the Owner, Architect and Construction Manager as an additional insured on the Contractor's commercial general liability and excess liability insurance policies. If the policy is written on a claims-made basis, the retroactive date must precede the date of the contract.

- a. The policy naming the Owner, Architect and Construction Manager as an additional insured shall:
  - i. Be an insurance policy from an A.M. Best rated "Secure" insurer, licensed in New York State.
  - ii. State that the coverage shall be primary and non-contributory coverage for the District, its Board, employees and volunteers.

- b. The Owner, Architect, and Construction Manager shall be listed as an additional insured by using endorsement CG 2038 or equivalent. The decision to accept an alternative endorsement rests solely with the Owner. A completed copy of the endorsement must be attached to the certificate of insurance.
- c. The certificate of insurance must describe the work that is covered by the liability policies.
- d. At the Owner's request, the Contractor shall provide a copy of the declaration page of the liability and excess policies with a list of endorsements and forms. If so requested, the Contractor will provide a copy of the policy endorsements and forms.
- e. The Contractor agrees to indemnify the Owner, Architect and Construction Manager for any applicable deductibles and self-insured retentions.

If written on a "claims-made" basis, the retroactive date must pre-date the inception of the Contract or agreement. Coverage shall remain in effect for two years following the completion of work. The testing company shall also provide proof of Workers' Compensation and NY State Disability Benefits Insurance, Commercial General Liability and Excess Liability with limits of \$2,000,000 each occurrence and in the aggregate.

Coverages 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.

B. Article 10 of the General Conditions shall remain in effect and the Contractor will be required to provide the insurance set for therein. The Contractor will be permitted to commence work on the Project with the insurance certificates currently on file with the Owner. On or before July 15 of each year, the Contractor will substitute said insurance certificates with insurance in strict compliance with Article 10. In addition to any other rights or remedies that the Owner may have in law, equity or pursuant to the General Conditions of Construction set forth in the Agreement between the Owner and the Contractor, in the event the Contractor fails to provide evidence of the insurance required by Article 10 by July 15, the Owner shall assess liquidated damages of \$1,000 for every day the Contractor fails to meet the requirements for insurance as set forth in Article 10 through final completion of the Project or the date the required insurance is submitted, whichever is earlier.

C. The insurance required to be procured by the Contractor, pursuant to paragraph A of this Article 10, shall be purchased from and maintained by an insurance carrier licensed to do business in the State of New York, with an A.M. Best Rating of "secured" or better. The Contractor must submit the Certificate of Insurance to the Architect for the Owner's approval prior to the commencement of any work. **EXCESS OR SURPLUS LINE INSURANCE CARRIERS WILL NOT BE ACCEPTED.**

D. All insurance coverage to be provided by the Contractor, pursuant to paragraph A of this Article 10, shall include a cancellation notice to the Owner pursuant to the policy terms and conditions. All insurance coverage to be provided by the Contractor shall name the Owner, Architect, and Construction Manager as additional insureds on the policy, with the exception of Owners Contractors Policies. Additionally, the insurance coverage to be provided by the Contractor, pursuant to paragraph A of this Article 10, shall state that the Contractor's coverage shall be the primary and non-contributory coverage for the Contractor's work. Contractors shall include a completed copy of the ACORD 855 - NY Construction Certificate of Liability, with explanations of "yes" responses to Items G through L.

E. In the event that any of the insurance coverage to be provided by the Contractor to the Owner contains a deductible, or a self-insured retention, or the insurance provided by the Owner contains a deductible, the Contractor shall indemnify and hold the Owner, Construction Manager, and the Architect harmless from the payment of such deductible or self-insured retention, which deductible shall in all circumstances remain the sole obligation and expense of the Contractor.

F. The Contractor acknowledges that its failure to obtain or keep current the insurance coverage required by paragraph A of this Article 10 shall constitute a material breach of Contract and subjects the Contractor to liability for damages, including but not limited to direct, indirect, consequential, special and such other damages the Owner sustains as a result of such breach. In addition, the Contractor shall be responsible for the indemnification to the Owner, Architect, and Construction Manager, of any and all costs associated with such lapse in coverage, including but not limited to reasonable attorney's fees.

G. The Contractor shall require all Subcontractors to carry insurance coverages and limits of liability, as set forth in paragraph A of this Article 10 and submit same to the Owner for approval prior to start of any work. In the event the Subcontractor is unable to provide insurance by a carrier that is licensed and admitted to do business in New York, the Owner reserves the right to accept Excess or Surplus lines insurance coverage for said Subcontractor, in the Owner's sole discretion. Notwithstanding the foregoing, the Owner is under no obligation to waive the requirement that the insurance be supplied by an insurer licensed and admitted in New York. In the event the Contractor fails to obtain the required certificates of insurance from the Subcontractor and a claim is made or suffered, the Contractor shall indemnify, defend, and hold harmless the Owner, Construction Manager, the Architect, Engineers, Consultants, and Sub-consultants and their agents or employees from any and all claims for which the required insurance would have provided coverage. This indemnity obligation is in addition to any other indemnity obligation provided in the Contract.

H. The Contractor assumes responsibility for all injury or destruction of the Contractor's materials, tools, machinery, equipment, appliances, shoring, scaffolding, false and form work, and personal property of the Contractor's employees from whatever cause arises. Any policy of insurance secured covering the Contractor or Subcontractors leased or hired by them and any policy of insurance covering the Contractor or Subcontractors against physical loss or damage to

such property shall include an endorsement waiving the right of subrogation against the Owner for any loss or damage to such property.

I. The Owner in good faith may adjust and settle a loss with the Contractor's insurance carrier.

J. The Owner and the Contractor waive all rights against each other and any of their Subcontractors, Sub-subcontractors, agents and employees for damages caused by fire or other perils to the extent of actual recovery of any insurance proceeds under any property insurance policy procured, pursuant to paragraph A of this Article 10, or other property insurance applicable to the Contractor's work.

K. Before commencement of its work, the Contractor shall obtain and pay for such insurance as may be required to comply with the indemnification and hold harmless provisions outlined under Article 12 of these General Conditions of the Contract for Construction.

L. Review and acknowledgment of the Certificate of Insurance by the Owner or the Architect shall not relieve or decrease the liability of the Contractor hereunder.

M. If the terms of policies expire, or the lives of the insurance companies terminate, before the Contract is completed or during the period of completed operations coverage, and the Contractor fails to maintain continuance of such insurance, the Owner is entitled to provide protection for itself, to pay premiums, and to charge the cost to the Contractor.

## **ARTICLE 11 REQUIRED BONDS FOR THE PROJECT**

A. Within ten (10) days of the award of the bid, the Contractor shall furnish a Performance Bond and Labor and Material Payment Bond meeting all statutory requirements of the State of New York.

B. All Surety companies are subject to the approval of the Owner and may be rejected by the Owner without cause.

C. Except as otherwise required by statute, the form and substance of such bonds shall be satisfactory to the Owner in the Owner's sole judgment.

D. Bonds shall be executed by a responsible surety licensed to do business in New York with an A.M. Best Rating of "A-" or better as to Policy Holder Ratings, and "VII" or better as to "Financial Size Category." Such bonds shall remain in effect for a period not less than two (2) years following final completion of the work by the Contractor.

E. Bonds shall further be executed by a surety that is currently listed on the U.S. Treasury Department Circular 570 entitled "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies," as amended.

F. The Performance Bond and the Labor and Material Payment Bond shall each be in an amount equal to 100% of the Contract Sum. The value of each bond shall be adjusted during the Project construction period to reflect changes in the Contract Sum.

G. Every Bond must display the Surety's Bond Number.

H. Each bond must be accompanied by an original Power of Attorney, giving the names of Attorneys-in-fact, and the extent of their bonding capacity.

I. A rider including the following provisions shall be attached to each Bond:

1. Surety hereby agrees that it consents to and waives notice of any addition, alteration, omission, change, or other modification of the Contract Documents. Such addition, alteration, change, extension of time, or other modification of the Contract Documents, or a forbearance on the part of either the Owner or the Contractor to the other, shall not release the Surety of its obligations hereunder and notice to the Surety of such matters is hereby waived.
2. Surety further agrees that in event of any default by the Owner in the performance of the Owner's obligations to the Contractor under the Contract, the Contractor or Surety shall cause written notice of such default (specifying said default in detail) to be given to the Owner, and the Owner shall have thirty (30) days from time after receipt of such notice within which to cure such default, or such additional reasonable period of time as may be required if the nature of such default is such that it cannot be cured within thirty (30) days. Such Notice of Default shall be sent by certified or registered U.S. Mail, return receipt requested, first class postage prepaid, to Lender and the Owner.
3. 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 three years after termination by the Owner of the Contractor's contract or within three years after final completion by the Contractor. In the event the Contractor files for bankruptcy, the commencement of the three year period shall not start to run until the bankruptcy proceeding is finalized or the Owner obtains relief from an automatic stay, whichever is later.

J. The Contractor shall deliver the required bonds to the Owner prior to beginning construction activity at the site, but no later than 10 days of issue date of Notice of Award of Contract. Said bonds shall be in the form set forth in the Project Manual. No work shall be performed by the Contractor until such bonds have been reviewed and approved.

K. The Owner may, in the Owner's sole discretion and without prior notice to the Contractor, inform surety of the progress of the Contractor's work and obtain consents as necessary to protect

the Owner's rights, interest, privileges and benefits under and pursuant to any bond issued in connection with the Contractor's work.

L. If the surety on any Bond furnished by Contractor is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of this Article, the Contractor shall within ten (10) days thereafter substitute another Performance and Payment Bond and surety, both of which must be acceptable to the Owner.

## **ARTICLE 12 INDEMNIFICATION**

A. The Contractor and its subcontractors shall indemnify and hold harmless (1) the Owner, its consultants, employees, officers and agents, (2) the Architect and its consultants, employees, officers and agents, and (3) the Construction Manager, its consultants, employees, officers and agents, and any of their respective employees, or agents from and against any and all claims, damages, losses, suits, obligations, fines, penalties, costs, charges and expenses, including but not limited to attorneys' fees, which may be imposed upon or incurred by or asserted against any of them by reason of any act or omission of such Contractor or any of its subcontractors or any person or firm directly or indirectly employed by such Contractor, for the act(s) and/or omission(s) of any Contractor or Subcontractor in connection with the work of the Project.

B. To the fullest extent permitted by law, the Contractor and its subcontractors shall indemnify and hold harmless (1) the Owner, its consultants, employees, officers and agents, (2) the Architect and its consultants, employees, officers and agents, and (3) the Construction Manager, its consultants, employees, officers and agents, and any of their respective employees, or agents from and against claims, damages, losses and expenses including but not limited to attorneys' fees, arising out of or resulting from performance of its 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 including loss of use resulting therefrom, but only to the extent caused in whole or in part by 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 which would otherwise exist as to a party or person described in this Paragraph B. The Contractor's indemnity obligations under this Paragraph B shall, but not by way of limitation, specifically include all claims and judgments which may be made against the Owner, the Architect, the Architect's consultants and agents and employees of any of them under any applicable statute, rule or regulation including the New York Statute, Occupational Safety and Hazardous Act, and the Federal Occupational Safety and Hazardous Act. In claims against any person or entity indemnified under this Paragraph B 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 this Paragraph B 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' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

C. The Contractor and its subcontractors shall indemnify and hold harmless (1) the Owner, its consultants, employees, officers and agents, (2) the Architect and its consultants, employees, officers and agents, and (3) the Construction Manager, its consultants, employees, officers and agents, and any of their respective employees or agents against any fines, penalties, judgments, or damages, including reasonable attorney's fees, imposed on or incurred by the parties indemnified hereunder which are incurred as a result of the Contractor's failure to give the notices required by Article 6(T) of these General Conditions of the Contract for Construction.

D. The Contractor and its subcontractors shall indemnify and hold harmless (1) the Owner, its consultants, employees, officers and agents, (2) the Architect and its consultants, employees, officers and agents, and (3) the Construction Manager, its consultants, employees, officers and agents, and any of their respective employees or agents against any actions, lawsuits or proceedings or claims of liens brought against each or any of them as a result of liens filed against the Contractor's project funds, including all the cost and expense of said liens, and including but not limited to attorneys' fees incurred by each or any of them.

E. The Contractor and its subcontractors shall indemnify and hold harmless (1) the Owner, its consultants, employees, officers and agents, (2) the Architect and its consultants, employees, officers and agents, and (3) the Construction Manager, its consultants, employees, officers and agents, and any of their respective employees or agents of and from any and all liability for violation of any laws and regulations applicable to the Contractor's work and shall defend any claims or actions which may be brought against the Owner as the result thereof. In the event that the Contractor shall fail to refuse to defend any such action, the Contractor shall be liable to the Owner for all costs of the Owner in defending such claim or action and all costs of the Owner, including attorney's fees, in recovering such defense costs from the Contractor.

F. The Contractor and its subcontractors shall indemnify and hold harmless (1) the Owner, its consultants, employees, officers and agents, (2) the Architect and its consultants, employees, officers and agents, and (3) the Construction Manager, its consultants, employees, officers and agents, and any of their respective employees or agents of and from any and all liability for claims made by third parties, including subcontractors, in connection with this Agreement and shall defend any claims or actions which may be brought against the Owner as the result thereof. In the event that the Contractor shall fail to refuse to defend any such action, the Contractor shall be liable to the Owner for all costs of the Owner in defending such claim or action and all costs of the Owner, including attorney's fees, in recovering such defense costs from the Contractor.

G. The indemnification obligations set forth herein shall become effective upon the Owner, Architect or Construction Manager's receipt of a claim for which the Contractor is required to provide indemnification to the Owner, Architect or Construction Manager. In the event the Owner, Architect or Construction Manager is required to bring an action to enforce the indemnification obligation, the Contractor shall be liable to the Owner, Architect, and/or Construction Manager for all costs associated with said action including attorneys' fees.

**ARTICLE 13**  
**TIME FOR COMPLETION OF WORK**

A. The date of commencement of the Contractor's work shall be as indicated in the agreement between the Contractor and the Owner. The date shall not be postponed or extended by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible to act. Time limits stated in the agreement between the Owner and the Contractor 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.

B. The Contractor shall not commence work on the site until two certified copies of all insurance policies and bonds required by Article 10 and Article 11 of these General Conditions of the Contract for Construction are provided to the Owner and accepted by the Owner. The date of commencement and/or completion of the Contractor's work shall not be changed by the effective date of such insurance. 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 acceptance of the insurance and bonds required by Article 10 and Article 11 of these General Conditions.

C. The Contractor shall proceed expeditiously with adequate forces and shall achieve substantial completion of its contract in accordance with the schedule set forth in its agreement. The Contractor shall cooperate with the Owner, Architect, Construction Manager, and other Contractors on the Project, making every reasonable effort to reduce the contract time.

D. 1. In the event the Owner determines that the performance of the Contractor's work, as of a milestone date, has not progressed or reached the level of completion required by its contract, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation, (1) working additional shifts or overtime, (2) supplying additional manpower, equipment, and facilities and (3) other similar measures (hereinafter referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the Contractor progresses its work in compliance with the stage of completion required by its agreement with the Owner. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule.

2. The Contractor shall not be entitled to an adjustment in its contract sum in connection with Extraordinary Measures ordered by the Owner under or pursuant to this Paragraph D.

3. The Owner may exercise the rights furnished the Owner under or pursuant to this Paragraph D as frequently as the Owner deems necessary to ensure that the Contractor's performance of its work will comply with any Milestone Date or completion date set forth in the Contractor's agreement with it.

4. The Owner reserves the right to withhold payment from the Contractor until such time as the Contractor submits a daily schedule showing work to be again on schedule with the Construction Schedule and/or until its work is being installed according to the project construction schedule, without additional cost to the Owner.

E. The Contractor shall achieve substantial completion of its work in accordance with the schedule for the work set forth in the project manual included as part of its agreement with the Owner. Milestone Dates are dates critical to the Owner's operations that establish when a part of the work is to commence or be complete. All Milestone Dates are of the essence and shall have the same meaning as Substantial Completion for the purpose of Liquidated Damages in this Article 13.

F. Substantial completion shall be achieved by the Contractor when the Contractor has completed ninety eight (98%) of its work. Work remaining to be completed after substantial completion shall be limited to items which can ordinarily be completed within the period between the payment at the time of substantial completion and final payment.

G. 1. This project is to be physically completed in accordance with the time limits set forth in the agreement between the Owner and Contractor and as further set forth in the project manual and/or bidding documents. Liquidated damages will be assessed in the amount of \$1,000.00 for each and every calendar day after such time allowed for completion.

2. Contractor realizes that time is of the essence on this Contract and the completion date and milestone date for each work item in its agreement, a Milestone Date reflected on the project schedule, or the date of substantial completion of the Contractor's work shall be no later than the date indicated therein. In the event the Contractor fails to complete any work or substantially complete the work under this contract by said schedule date, the sum per calendar day for each date not met, as delineated above, will be subtracted from the payment due the Contractor (or, if the amount due Contractor as payment is insufficient, any deficiency shall be paid by the Contractor to the Owner), except in cases where the Contractor has applied for and been granted an extension of time in accordance with the provisions of this Article 13.

3. The said sum per calendar day shall constitute the Liquidated Damages incurred by the Owner for each day of delay beyond the agreed upon dates of Substantial Completion. Such Liquidated Damages shall be in addition to any other damages (other than by reason of delay) Owner may incur as a result of Contractor's breach of Contract. In the event that substantial completion of its work is not achieved in accordance with the project schedule, inspections will be performed once each week unless the Owner or the Architect determines, at their sole discretion, that additional inspections are not needed. All costs incurred by the Owner, Owner's Representative and the cost of additional inspections, at the rate of One Thousand Dollars (\$1,000) per inspection, will be subtracted from payment due the Contractor. If the amount due the Contractor for payment is insufficient, any deficiency shall be paid by the Contractor to the Owner.

H. 1. Within five (5) calendar days from the occurrence of same, the Contractor must apply in writing to the Owner, its Architect or Construction Manager for an extension of time to complete its work where it has been delayed as a result of: unforeseeable causes beyond the control and without the fault or negligence of the contractor, including acts of God, acts of the public enemy, acts of the federal or state government in either their sovereign or contractual capacities, fires, floods, epidemics, quarantine restrictions, priority or allocation orders duly issued by the federal government; freight embargoes; changes in the work to be performed by the Contractor. The Contractor may not apply for an extension of time for delays in acquisitions of materials other than by reason of freight embargoes. All other delays of the project, including but not limited to, Architect review and/or approval of shop drawings and/or submittals, requests for information, clarifications, samples, and change orders; Owner schedule; Architect certification of payment; payment by Owner of Contractor's Application for Payment; coordination amongst Contractors; unavailability of materials and/or equipment; surveying/testing; closeout, etc. are deemed to be foreseeable and, therefore shall not form the basis for a claim for an extension of time by the Contractor.

2. All claims for additional time shall be supported by documentation which demonstrates to the Architect and Construction Manager's satisfaction that the Critical path of the Work has been significantly altered by the delays to the activities in question, and that the schedule cannot be maintained by re-ordering other activities within the project at no cost. Upon receipt of the Contractor's request for an extension of time, the Owner will ascertain the facts and extent of the delay, and may, in its sole discretion, extend the time for completion of the Contractor's work when in its judgment such an extension is justified. The Owner's determination will be final and binding in any litigation commenced by the Contractor against the Owner which arises out of the Owner's denial of an extension of time to the Contractor. Any approval of an extension of the Contractor's time to complete its work shall be memorialized by written change order, signed by the Owner, Contractor, Architect and Construction Manager. Where the Owner determines that the Contractor will be granted an extension of time, such extension shall be computed in accordance with the following:

For each day of delay in the completion of its work, the Contractor shall be allowed one day of additional time to complete its contract. The Contractor shall not be entitled to receive a separate extension of time for each one of several causes of delay operating concurrently; only the actual period of delay as determined by the Owner or its Architect may be allowed.

3. Notwithstanding anything to the contrary in the Contract Documents, an extension in the contract time, to the extent permitted under subparagraph H of this Article 13, shall be the sole remedy of the Contractor for any (1) delay in the commencement, prosecution, or completion of the Work; (2) hindrance or obstruction in the performance of the Work; (3) loss of productivity or acceleration; or (4) other similar claims (collective referred to herein as "delay(s)"), unless a delay is caused by the Owner's active interference with the Contractor's performance of the Work, and only to the extent such acts continue after the Contractor furnishes the Owner with three (3) days' written notice of such interference. In no event shall the

Contractor be entitled to any compensation or recovery of any damages in connection with any Delay, including, but not limited to, consequential damages, lost opportunity costs, impact damages, or other similar remuneration. The Owner's exercise of any of its rights or remedies under the Contract Documents (including, but not limited to, ordering changes in the Work, or directing suspension, rescheduling or correction of the Work), regardless of the extent or frequency of the Owner's exercise of such rights or remedies, shall not be construed as active interference with the Contractor's performance of the Work.

#### **ARTICLE 14 DEFICIENT AND INCOMPLETE WORK**

A. The Owner, through its Architect or Construction Manager, will have the authority to reject work performed by the Contractor which does not conform to the requirements of the drawings and/or specifications.

B. The Owner, through its Architect or Construction Manager, shall have the authority to require additional inspection or testing of the Contractor's work whether or not such work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the work to have performed additional inspection or testing of the work.

C. 1. If a portion of the Contractor's work is covered contrary to the Architect's request or to requirements specifically expressed in the drawings and/or specifications, upon request by the Architect or the Construction Manager, the Contractor shall uncover such work for the Architect's or any governmental authority's observation and be replaced at the Contractor's sole expense without change in the Contract Time or Contract Sum.

2. If a portion of the Contractor's work has been covered which the Architect or any governmental authority has not specifically requested to observe prior to its being covered, the Architect or any governmental authority may request to see such work and it shall be uncovered by the Contractor. If such work is in accordance with the drawings and/or specifications, costs of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work is not in accordance with the Contract Documents, the Contractor, at its sole cost and expense, shall uncover and replace such work.

D. The Contractor shall promptly correct work rejected by the Owner, through its Architect or Construction Manager, or failing to conform to the requirements of its contract with the Owner, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear the all costs of correcting such rejected work, including but not limited to the cost of said additional testing and/or inspection, the cost of the Architect's services incurred in conjunction with such additional testing, and any cost, loss or damages to the Owner resulting from such actions. If prior to the date of Substantial Completion, the Contractor, a Sub-contractor or anyone for whom either is responsible uses or damages any

portion of the Work or premises, including, without limitation, mechanical, electrical, plumbing and other building systems, machinery, equipment or other mechanical device, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner.

E. If the Contractor (1) fails to correct work which is not in accordance with the requirements of its agreement with the Owner, or (2) fails to carry out its work in accordance with the requirements of its agreement with the Owner, or (3) fails or refuses to provide a sufficient amount of properly supervised and coordinated labor, materials, or equipment so as to be able to complete the work within the contract time, or (4) fails to remove and discharge (within ten (10) days) any lien filed upon Owner's property by anyone claiming by, through, or under the Contractor, or (5) disregards the instructions of the Architect, Owner or Construction Manager, the Construction Manager, on behalf of the Owner may order the Contractor to stop its 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. This right shall be in addition to, and not in restriction of, other rights the Owner may have pursuant to these General Conditions or at law.

F. 1. If the Contractor defaults or neglects to carry out its work in accordance with its agreement with the Owner and fails within a three (3) day period after receipt of written notice from the Construction Manager 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 cost of correcting such deficiencies, including compensation for the Architect, the Construction Manager and the Owner and such other consultants whose participation is deemed necessary by the Architect, for additional services and expenses made necessary by such default, neglect or failure. Such action by the Construction Manager, including the amounts to be charged to the Contractor as a result of such action are subject to the prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

2. Where the Contractor's default and/or neglect to carry out its work in accordance with its agreement with the Owner threatens the health, safety and/or welfare of the occupants of the school district's facilities and/or threatens the structural integrity and/or preservation of the school district's facilities, the Owner may proceed to carry out the Contractor's work upon twenty-four (24) hours notice of its intention to do so to the Contractor.

G. If the Owner prefers to accept work which is not in accordance with the terms and conditions of the agreement between the Owner and the Contractor, the Owner may, in its discretion, accept such work and reduce the Contractor's contract sum accordingly.

**ARTICLE 15**  
**FINAL COMPLETION AND CLOSEOUT OF THE PROJECT**

A. 1. When advised by the Construction Manager that the Contractor's work is near substantial completion, the Architect shall visit the site to determine whether the Contractor's work is substantially complete. If the Architect's observations of the Contractor's work discloses any item which has not been performed in accordance with the requirements of the drawings and/or specifications and/or which has not been completed to the point indicated in Article 13 paragraph F of these General Conditions, the Contractor shall complete or correct such items upon receipt of notification from the Architect that a deficiency exists. The Architect shall not issue a certificate of substantial completion for the work of the Contractor until the work has been completed in accordance with Article 13(F). Upon completion of the work outlined by the Architect to it in accordance with this paragraph A, the Contractor shall advise the Architect of the need for an inspection of the work. If the Architect is required to inspect the Contractor's work more than twice, the Contractor shall be liable to the Owner for the services performed by the Architect as a result of additional inspections.

2. Upon determining that the Contractor's work has progressed to the point of Substantial Completion, the Architect shall prepare a punch list of the Contractor's work which shall include only minor items of work remaining to be performed by the Contractor to bring its work into compliance with the requirements of the drawings and/or specifications. The Contractor shall proceed promptly to complete and correct items on the punch list issued by the Architect and shall complete said items within thirty (30) days of its receipt of the punch list from the Architect. At the time of substantial completion, the Owner shall retain 200 percent of the value of the punch list items from the Contractor's remaining contract sum. The value of said remaining work shall be determined by the Architect. Upon completion of the work reflected in the final punch list, the Owner shall release the monies withheld pursuant to this paragraph to the Contractor.

3. The Architect's failure to include an item of deficiency on the punch list issued to the Contractor shall not relieve the contractor of its responsibility to perform its work in accordance with the drawings and/or specifications.

B. 1. If within three (3) years after the date of Substantial Completion of the Contractor's work or designated portion thereof, or after the date for commencement of warranties established pursuant to these General Conditions, or by terms of in applicable special warranty required by the agreement between the Owner and the Contractor, any of the Work is found to be not in accordance with the requirements of said agreement, 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. This period of three (3) years shall be extended with respect to portions of the Contractor's work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of such work. The obligation set forth hereunder shall survive acceptance by the Owner of the Contractor's and/or termination of the Contractor's agreement with the Owner. The Owner shall give such notice within a reasonable period of time after discovery of the condition.

2. The Contractor shall, within a reasonable time after receipt of written notice thereof, but in no event no later than seventy-two (72) hours after receipt of such notice, commence to correct, repair, and make good any defects in its work.

3. The obligations of the Contractor pursuant to this paragraph shall cover any repairs to or replacement of work affected by the defective work.

4. In the case of any work performed in correcting defects pursuant to this paragraph, the guarantee periods specified herein shall begin anew from the date of acceptance by the Owner of such work.

C. Upon receipt of written notice from the Construction Manager that the Contractor's work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Contractor's work acceptable pursuant to the terms and conditions of its agreement with the Owner and the Contract fully performed and upon receipt of the closeout documentation required by the Contract Documents and elsewhere in the agreement between the Owner and the Contractor, the Architect will certify to the Owner that the Contractor is entitled to final payment on the project.

D. 1. Prior to receipt of final payment from the Owner, the Contractor shall provide to the Architect the close out documentation required by the Contract Documents.

2. The Contractor shall schedule a close out meeting with the Architect and the Construction Manager for the purpose of delivering the close out documents required pursuant to the Contract Documents and elsewhere in the agreement between the Owner and the Contractor.

E. If the Contractor's work is not accepted by the Owner after final inspection and additional time is required to complete items identified during the final inspection, the date starting the warranty periods described in the Contract Documents shall be set by the Architect at his discretion.

F. If the Architect is required to perform more than one final inspection because the Contractor's work fails to comply with the requirements of the contract, the amount of compensation paid to the Architect by the Owner for additional services shall be deducted from the final payment to the Contractor.

G. Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those claims previously made in writing in accordance with the terms of Article 18 hereof and identified by that payee as unsettled at the time of final Application for Payment.

H. Contractor shall submit all documentation identified in this section within ninety (90) days from the date of Substantial Completion. If the documentation has not been submitted, the

Owner will obtain same through whatever means necessary. The Contractor shall solely be responsible for all expenses incurred by the Owner in securing such documentation.

**ARTICLE 16**  
**RELEVANT STATUTORY PROVISIONS**

A. The Contractor shall at all times observe and comply with all Federal and State Laws and all Laws, Ordinances and Regulations of the Owner, in any manner affecting the work and all such orders decreed as exist at present and those which may be enacted later, by bodies or tribunals having jurisdiction or authority over the work, and the Contractor shall indemnify and save harmless the Owner and all his officers, agents, or servants against any claim or liability arising from, or based on, a violation of any such law, ordinances, regulation, order or decree, whether by himself or by his employee or agents.

B. The Contractor and each of its subcontractors shall comply with Prevailing Wage Rates as issued by the State of New York Department of Labor for the location and duration of this Project and shall comply with all requirements governing its payments to its employees as set forth in Labor Law, section 220 et seq of the New York State Labor Law, as amended.

C. The Contractor and each of its subcontractors shall post a notice at the beginning of the performance of every public work contract on each job site that includes the telephone number and addresses 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 particular job classification.

D. The Contractor specifically agrees, as required by Labor Law, Sections 220 and 220-d, as amended, that:

1. No laborer, workman or mechanic in the employ of the Contractor, subcontractor or other person doing or contracting to do the whole or any part of the work contemplated by the Contract, shall be permitted or required to work more than eight hours in any one calendar day or more than five days in any one week, except in the emergencies set forth in the Labor Law.
2. The wages paid for a legal day's work shall not be less than the prevailing rate of wages as defined by law.
3. The minimum hourly rate of wages to be paid shall not be less than that stated in the Project Manual, and any re-determination of the prevailing rate of wages after the Contract is approved shall be deemed to be incorporated herein by reference as of the effective date of re-determination and shall form a part of this Contract. The Labor Law provides that the Contract may be forfeited and no sum paid for any work done thereunder on a second conviction for willfully paying less than:

a. The stipulated wage scale as provided in Labor Law, Section 220, Sub division 3, as amended; or

b. The stipulated minimum hourly wage scale as provided in Labor Law, Section 220-d, as amended.

E. The Contractor acknowledges that its work is governed by the provisions of Section 101 of the General Municipal Law of the State of New York.

F. The Contractor specifically agrees, as required by the provisions of the Labor Law of New York, Section 220-E, as amended that:

1. In the hiring of employees for the performance of this contract or any sub-contractor hereunder, no contractor, sub-contractor, nor any person acting on behalf of such contractor or sub-contractor shall by reason of race, creed, color 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.
2. No contractor, sub-contractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this contract on account of race, color, creed, sex or national origin.
3. There may be deducted from the amount payable to the Contractor a penalty of fifty dollars for each person for each calendar day during which such person was discriminated against or intimidated in violation of the provisions of the Contract.
4. This Contract may be canceled or terminated by the Owner and all monies due or to become due hereunder may be forfeited for a second or any subsequent violation of the terms or conditions of this section of the Contract.

The aforesaid provisions of this section covering every Contract for or on behalf of the Owner, the State or a municipality for the manufacture, sale or distribution of materials, equipment or supplies shall be limited to operations performed within the territorial limits of the State of New York.

G. The successful Contractor shall conform to the guidelines spelled out in the County's Affirmative Action Program, if any.

H. The Contractor shall comply with all of the provisions of the Immigration Reform and Control Act of 1986 and regulations promulgated pursuant thereto and shall require its subcontractors to comply with same. The Contractor shall and does hereby agree to fully indemnify, protect, defend, and hold harmless the Owner, Owner's agents and employees from and against any penalties, fees, costs, liabilities, suits, claims, or expenses of any kind or nature, including reasonable attorney's fees, arising out of or resulting from any violation or alleged violation of the provisions of said laws in connection with the work performed hereunder.

I. This Contract shall be void if the Contractor fails to install, maintain, and effectively operate appliances and methods for the elimination of harmful dust when a harmful dust shall have been identified in accordance with Section 222-a of the Labor Law of the State of New York.

J. The Contractor shall insure that absolutely no asbestos containing material is used in conjunction with the performance of its work. The Contractor bears the sole responsibility to provide assurances that no asbestos containing material is built into the construction, or that any equipment used in the construction contains any asbestos containing material. If asbestos containing material is found, at any time during or after the construction is completed, it shall be the responsibility of the Contractor who installed said material to remove it and replace it with new non-asbestos containing material, as per federal, state and local mandates.

K. Large and small asbestos abatement projects as defined by 12 N.Y.C.R.R. 56 shall not be performed while the building is occupied. As referenced in this section, the term "building" shall mean a wing or major section of a building that can be completely isolated from the rest of the building with sealed non-combustible construction. The isolated portion of the building must contain exits that do not pass through the occupied portion, and ventilation systems must be physically separated and sealed at the isolation barrier. Exterior work such as roofing, flashing, siding or soffit work may be performed on occupied buildings provided proper variances are in place as required, and complete isolation of ventilation systems and windows is provided. Work must be scheduled so that classes are not disrupted by noise or visual distraction.

L. Surfaces that will be disturbed by reconstruction must have a determination made as to the presence of lead. Projects which disturb surfaces that contain lead shall have in the specifications a plan prepared by a certified Lead Risk Assessor or Supervisor which details provisions for occupant protection, worksite preparation, work methods, cleaning and clearance testing which are in general accordance with the HUD Guidelines.

M. No smoking is allowed anywhere on school property per New York State and County law. Violators are subject to a \$1,000 fine and/or banishment from the property.

N. Applicable codes and standards for material furnished and work installed shall include all state laws, local ordinances, requirements of governmental agencies having jurisdiction, and applicable requirements of following codes and standards, including but not limited to:

1. New York State Uniform Fire Prevention and Building Code, and amendments thereto.
2. New York State Energy Conservation Construction Code.
3. State Education Department Manual of Planning Standards.
4. New York State Department of Transportation, Office of Engineering, Standard Specification, Construction and Materials, latest edition.
5. Life Safety Code - NFPA.

O. Wherever in the specifications reference is made to ANSI or ASTM Standards, Federal

Specifications, Consumer Product Standards, or similar recognized standards, the latest edition of the respective publishing agency in effect at the date of "Bid Issuance" shall be accepted as establishing the technical requirements for which compliance is required.

P. The Owner shall be entitled to request of Contractor or its successor in interest adequate assurance of future performance in accordance with the terms and conditions of its agreement in the event (1) an order for relief is entered on behalf of the Contractor pursuant to Title 11 of the United States Code, (2) any other similar order is entered under any other debtor relief laws, (3) the Contractor makes a general assignment for the benefit of its creditors, (4) a receiver is appointed for the benefit of its creditors, or (5) a receiver is appointed on account of its insolvency. Failure to comply with such request within ten (10) days of delivery of the request shall entitle the Owner to terminate the Contract in accordance with Article 17 hereof. In all events, pending receipt of adequate assurance of performance and actual performance in accordance therewith, the Owner shall be entitled to proceed with the Contractor's work with its own forces or with other contractors on a time and material or other appropriate basis, the cost of which will be back charged against the Contractor.

Q. The Contractor shall maintain policies of employment as follows:

1. The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

2. The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.

#### **ARTICLE 17 TERMINATION OR SUSPENSION**

- A. 1. The Owner may terminate the Contractor's agreement in the event the Contractor:
- a. refuses or fails to supply sufficient skilled workers or suitable materials or equipment to complete the Work in a diligent, efficient, timely, workmanlike, skillful, and careful manner;
  - b. refuses or fails to correct deficient work performed by it;

- c. fails to make prompt payments to subcontractors for labor, materials, and/or equipment in accordance with the respective agreements between the Contractor and the Subcontractors;
- d. disregards laws, ordinances, rules, regulations, or orders of a public authority having jurisdiction;
- e. disregards the instructions of the Architect, Construction Manager or the Owner (when such instructions are based on the requirements of the Contract Documents);
- f. is adjudged a bankrupt or insolvent, or makes a general assignment for the benefit of Contractor's creditors, or a trustee or receiver is appointed for Contractor or for any of its property, or files a petition to take advantage of any debtor's act or to reorganize under bankruptcy or similar laws; or
- g. breaches any warranty made by the Contractor under or pursuant to the Contract Documents.
- h. fails to furnish the Owner with assurances satisfactory to the Owner evidencing the Contractor's ability to complete the Work in compliance with all the requirements of the Contract Documents; or
- i. fails after commencement of the Work to proceed continuously with the construction and completion of the Work for more than ten (10) days, except as permitted under the Contract Documents.
- j. fails to keep the Project free from strikes, work stoppages, slowdowns, lockouts or other disruptive activity;
- k. or otherwise does not fully comply with the Contract Documents.

2. When any of the above reasons exists, may without prejudice to any other rights or remedies of the Owner, terminate employment of the Contractor upon three (3) days written notice and may, subject to any prior rights of the surety:

- a. take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- b. take possession of materials stored off site by the Contractor;
- c. take assignments of the Contractor's subcontractors in accordance with these General Conditions;

- d. finish the Work by whatever reasonable method the Owner may deem expedient.

3. When the Owner terminates the Contract for one of the reasons stated in Subparagraph 1 hereof, the Contractor shall not be entitled to receive further payment until the completion of the Contractor's work. If the Owner's costs to complete the Contractor's work, including the expenses incurred by the Owner in connection with the services of the Architect, the Construction Manager and/or other consultants, exceed the contract balance remaining on the Contractor's contract, the Contractor shall be liable to the Owner for such excess costs. This provision shall survive termination of the Contractor's agreement with the Owner.

B. 1. In addition to the Owner's right to carry out the work of the Contractor pursuant to its agreement with the Contractor, the Owner may at any time, at will and without cause, terminate any part of the Contractor's work or all of the Contractor's remaining work for any reason whatsoever by giving three (3) days' written notice to Contractor, specifying the portion of the Contractor's work to be terminated and the effective date of termination.

2. Upon receipt of a notice of termination for convenience, the Contractor shall immediately, in accordance with instructions from the Owner, proceed with performance of the following duties regardless of delay in determining or adjusting amounts due under this Paragraph:

- a. cease operation as specified in the notice;
- b. place no further orders and enter into no further subcontracts for materials, labor, services or facilities except as necessary to complete continued portions of the Contract;
- c. terminate all subcontracts and orders to the extent they relate to the Work terminated;
- d. proceed to complete the performance of the remaining work on its contract which has not been so terminated; and
- e. take actions that may be necessary, or that the Owner may direct, for the protection and preservation of the terminated Work.

3. The Contractor shall continue to prosecute that portion of its work which has not been terminated by the Owner pursuant to this paragraph. If the Contractor's work is so terminated, the Owner shall not be liable to the Contractor by reason of such termination except that the Contractor shall be entitled to payment for the work it has properly executed in accordance with its agreement and prior to the effective date of termination (the basis for such payment shall be as provided in the Contract) and for costs directly related to work thereafter performed by Contractor in terminating such Work, provided such work is authorized in advance by the Architect and the Owner. No payment shall be made by Owner, however, to the extent

that such work is, was, or could have been terminated under the Contractor's agreement with the Owner.

4. In case of a termination pursuant to this paragraph B, the Owner will issue a Construction Change Directive or authorize a Change Order, making any required adjustment to the Date of Substantial Completion and/or the sum of contract monies remaining to be paid to the Contractor. The Owner shall be credited for (1) payments previously made to the Contractor for the terminated portion of the Work, (2) claims which the Owner has against the Contractor under the Contract and (3) the value of the materials, supplies, equipment or other items that are to be disposed of by the Contractor that are part of the Contract Sum; multiplied by 15% representing the Contractor's overhead and profit.

5. For the remaining portions of the Contractor's work which have not been terminated pursuant to this paragraph B, the terms and conditions of the Contractor's agreement with the Owner shall remain in full force and effect.

6. Upon termination of the Contractor's work or a portion of the Contractor's work pursuant to this paragraph B, the Contractor shall recover as its sole remedy, payment for work which it has properly performed in connection with the terminated portion of the Work prior to the effective date of termination and for items properly and timely fabricated off the Project site, delivered and stored in accordance with the Owner's instructions. The Contractor hereby waives and forfeits all other claims for payment and damages, including, without limitation, overhead and profit related to work terminated by the Owner pursuant to this paragraph B.

C. 1. In addition to Owner's right to suspend, delay, or interrupt Contractor from proceeding with any portion of its work pursuant to the terms and conditions of its agreement with the Owner, the Owner may at any time, at will and without cause suspend, delay, or interrupt any part of the Contractor's work or all work for any reason whatsoever for such period of time as the Owner may determine by giving three (3) days' prior written notice to Contractor, specifying that portion of the Contractor's work which is to be suspended, delayed, or interrupted, and the effective date of such suspension, delay, or interruption, as the case may be.

2. The Contractor shall continue to prosecute that portion of its work which has not been suspended, delayed, or interrupted, and shall properly protect and secure the portion of its work so suspended, delayed or interrupted.

3. The Owner shall incur no liability to Contractor by reason of such suspension, delay, or interruption except that Contractor may request an extension of its time to complete its work in accordance with Article 13 hereof.

D. The Contractor agrees and acknowledges that payments for the work have been obtained through obligations or bonds which have been sold after public referendum. In the event the work is suspended or canceled as a result of the order of any court, agency, department entity or individual having jurisdiction, or in the event the work is suspended or canceled due to the fact that a court, agency, department, entity or individual having jurisdiction has issued an order, the

result of which is that the aforesaid obligations or bonds are no longer available for payment for the work, the Contractor expressly agrees that it shall be solely entitled to payment for work accomplished until a notice of suspension or cancellation is served upon it. The Contractor expressly waives any and all rights to institute an action, claim, cause of action or similar for any damages it may suffer as a result of the suspension or cancellation of the Work and/or its contract pursuant to this section.

## ARTICLE 18 CLAIMS AND DISPUTES

A. Definition. A "Claim" is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract.

B. Time Limits on Claims. Claims by the Contractor must be made within thirty (30) days after occurrence of the event giving rise to such Claim, or within thirty (30) days after the claimant first recognizes the condition giving rise to the Claim, whichever is earlier. Claims must be made by written notice. An additional Claim made after the initial Claim has been decided by the Owner will not be considered unless submitted in a timely manner. Failure of the Contractor to give timely notice of claim shall constitute waiver of the claim. Claims must be made by written notice to the Construction Manager, Architect and Owner. The responsibility to substantiate Claims shall rest with the Contractor.

C. Pending final resolution of a Claim, unless otherwise agreed in writing, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

D. Claims for Concealed or Unknown Conditions. If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which 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, then notice by the Contractor shall be given to the Owner and Architect promptly before conditions are disturbed and in no event later than five (5) days after first observance of the conditions; and, (3) in the case of a condition at the site which involves a hazardous or toxic substance, as those terms are defined by OSHA or AHERA, notice to the Owner, the Construction Manager and the Architect shall be given immediately upon discovery of such hazardous or toxic substance. The Architect, and/or Construction Manager will promptly investigate such conditions and, if 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 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 so notify the Contractor in writing,

stating the reasons.

E. Claims for Additional Cost. If the Contractor wishes to make Claim for an increase in the Contract Sum as a result of a Change in the Work pursuant to Article 8 of these General Conditions, written notice as provided in this Article 18 shall be given before proceeding to execute the Work.

F. Claims for Additional Time. If the Contractor wishes to make Claim for an increase in the Contract Time, the Contractor shall comply with the requirements set forth in Article 13.

G. Nothing contained in the Contract Documents shall relieve a Contractor from compliance with any statutory requirement, including, but not limited to those contained in Education Law Section 3813.

## ARTICLE 19 MISCELLANEOUS PROVISIONS

A. The agreement between the Owner and the Contractor shall be governed by the law of the place where the project is located; venue to be in the County in which the project is located.

B. Historical lack of enforcement of any law, local or otherwise, shall not constitute a waiver of Contractor's responsibility for compliance with such law in a manner consistent with its agreement with the Owner unless and until the Contractor has received written consent for the waiver of such compliance from the Owner and the Agency responsible for the enforcement of such law.

C. All notices to be given hereunder shall be in writing and may be given, served, or made (1) by depositing the same for first class mail delivery in the United States mail addressed to the authorized representative of the party to be notified; (2) by depositing the same in the United States mail addressed to the authorized representative of the party to be notified, postpaid and registered or certified with return receipt requested; (3) by depositing the same for overnight delivery (prepaid by or billed to the party giving notice) with the United States Postal Service or other nationally recognized overnight delivery service addressed to the authorized representative of the party to be notified; or (4) by delivering the same in person to the said authorized representative of such party. Notice deposited in the mail by certified mail or overnight delivery in accordance with the provisions hereof shall be effective from and after the fourth (4th) day next following the date postmarked on the envelope containing such notice, or when actually received, whichever is earlier. All notices to be given to the parties hereto shall be sent to or made at the addresses set forth hereinbelow. By giving the other parties at least seven (7) days' written notice thereof, the parties hereto shall have the right to change their respective addresses and specify as their respective addresses for the purposes hereof any other address in the United States of America.

D. Except as expressly provided in the agreement between the Owner and the Contractor, duties and obligations imposed by such agreement 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, or in equity or by other agreement, and such rights and remedies shall survive acceptance of the Contractor's work and/or any other termination of the Contractor's agreement with the Owner.

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

F. The headings denoting the separately numbered Articles of these General Conditions are specifically set forth for reference purposes only and are not in any way to be deemed explanatory of or limiting of the contents of any paragraph or subparagraph. Furthermore, said headings are not to be deemed part of this Agreement for purposes of interpretation, litigation or as defining or limiting the rights or obligations of the parties.

G. In case any provision of this Agreement should be held to be contrary to, or invalid, under the law of any country, state or other jurisdiction, such illegality or invalidity, shall not affect in any way, any other provisions hereof, all of which shall continue, nevertheless, in full force and effect in any country, state or jurisdiction in which such provision is legal and valid.

H. The rights stated in these General Conditions and the documents which form the agreement between the Owner and the Contractor are cumulative and not in limitation of any rights of the Owner at law or in equity.

I. The Owner shall not be responsible for damages or for loss of anticipated profits on work not performed on account of any termination of the Contractor by the Owner or by virtue of the Owner's exercise of its right to take over the Contractor's work pursuant to its agreement with the Contractor.

J. The Owner shall not be liable to the Contractor for punitive damages on account of any its termination of the Contractor or any other alleged breach of the agreement between it and the Contractor and the Contractor hereby expressly waives its right to claim such damages against the Owner.

K. The Contractor hereby expressly waives any rights it may have in law or in equity to lost bonding capacity as a result of any of the actions of the Owner, the Architect or the Construction Manager taken in connection with the Contractor's work on the Project.

L. Upon determination by legal means (e.g. court action, etc.) that termination of Contractor pursuant to Article 17.A.1 was wrongful, such termination will be deemed converted to a termination for convenience pursuant to Article 17.B.1 and Contractor's remedy for such termination shall be limited to the recovery of the payments permitted for termination for convenience as set forth in Article 17.B.1.

M. As between the Owner and Contractor:

1. Before Substantial Completion. As to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion;
2. Between Substantial Completion and Final Certificate for Payment. As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment; and
3. After Final Certificate for Payment. As to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to warranties provided in accordance with its agreement with the Owner, the date of any correction of work performed by the Contractor or failure to correct its work, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or Owner, whichever occurs last.

N. 1. The Owner may occupy or use any completed or partially completed portion of the Contractor's work at any stage when such occupancy is authorized by public authorities having jurisdiction over the project.

2. Partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of the Contractor's work, nor does it waive the Owner's right to liquidated damages. Further such occupancy alone shall not determine when substantial completion and performance has been reached.

3. Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Contractor's work, and in order to prepare a complete punchlist of omissions of materials, faulty workmanship, or any items to be repaired, torn out or replaced.

O. The Contractor agrees not to assign, transfer, convey or sublet or otherwise dispose of this Contract or his right, title and interest therein or his power to execute such Contract, to any other person, firm or corporation without the previous consent in writing of the Owner.

P. The Owner is a tax exempt organization and will take title to materials used in the Project in order to permit tax exemption.

Q. The Owner will furnish a certificate with the Owner's Tax Exemption Number to the Contractor for use in purchasing tangible personal property required for the Project.

R. This exemption shall not apply to machinery, equipment, tools, and other items purchased, leased, rented, or otherwise acquired for the Contractor's use even though the machinery, equipment, tools or other items are used either in part or entirely on the Work. This exemption shall apply only to materials fully incorporated into the Work of the Contract as accepted and approved by the Architect.

S. The Contractor shall, upon request by the Owner, furnish a bill of sale or other instrument indicating the quantities and types of materials purchased directly by the Contractor or subcontractor for incorporation into the Work. Upon delivery of the materials to the site, the Contractor shall mark or otherwise identify the materials to be incorporated into the Work. This exemption shall apply only to materials so identified and accepted.

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*END OF GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION*

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**REQUISITION FOR PARTIAL PAYMENT – WAIVER OF LIEN**

<b>PROJECT</b>	<b>OWNER</b>
<b>GENERAL CONTRACTOR</b>	<b>SUB-CONTRACTOR/VENDOR</b>
<b>CONTRACT</b>	<b>WORK COMPLETE</b>
PROJECT:	CONTRACT - \$
TRADE:	CHANGE ORDERS - \$
CONTRACT - \$	TOTAL COMPLETE - \$
CHANGE ORDERS - \$	RETAINAGE (    %) - \$
TOTAL CONTRACT - \$	LESS PRE. REQ. - \$
	THIS REQUISITION - \$

**Waiver of Lien**

The undersigned, upon receipt of the above requisition payment hereby releases and discharges the Owner of and from any liability or obligation in any way related to or arising out of this project up to and including the date of this document.

The undersigned further covenants and agrees that it shall not in any way claim or file a mechanic's or other lien against the premises of the above designated project, or any part thereof, or against any fund applicable thereto for any of the work, labor, or materials heretofore furnished by it in connection with the improvement of said premises.

The undersigned further warrants that, in order to induce the Owner to release this partial payment, they have paid all claims for labor, material, insurance, taxes, equipment, etc., employed in the prosecution of the work above, to date of this requisition.

The undersigned hereby releases and agrees to hold the Owner harmless from any and all claims in connection with the furnishing of such labor and materials, etc., for the construction of the aforementioned project.

The undersigned further guarantees that all portions of the work furnished and/or provided by them are in accordance with the Contract and that the terms of the Contract with respect to these guarantees will hold for the period specified in said Contract.

IN WITNESS WHEREOF, we have executed under seal this release on the above date and to be legally bound hereby:

WITNESS: \_\_\_\_\_ FIRM: \_\_\_\_\_

BY: \_\_\_\_\_

**CORPORATE ACKNOWLEDGEMENT**

State of

) SS.  
)

County of

On the \_\_\_\_\_ day of \_\_\_\_\_, before me came \_\_\_\_\_ to me known and who by me being duly sworn did depose and say that s/he resides at \_\_\_\_\_; that s/he is the officer of the said corporation executing the foregoing instrument, that s/he knows the seal of said corporation, that the seal affixed to said instrument is such corporate seal, that it was so affixed by order of the Board of Directors of said corporation and that s/he signed her/his name thereto by like order.

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

**INDIVIDUAL ACKNOWLEDGEMENT**

State of

) SS.  
)

County of

On the \_\_\_\_\_ day of \_\_\_\_\_, before me came \_\_\_\_\_ to me known and who by me being duly sworn did depose and say that s/he resides at \_\_\_\_\_; that s/he is the individual who executed the foregoing instrument.

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

**PARTNERSHIP ACKNOWLEDGEMENT**

State of

) SS.  
)

County of

On the \_\_\_\_\_ day of \_\_\_\_\_, before me came \_\_\_\_\_ to me known and who by me being duly sworn did depose and say that s/he resides at \_\_\_\_\_; that s/he is the partner in the firm of \_\_\_\_\_ doing business under the name of \_\_\_\_\_ and that s/he executed the foregoing instrument on behalf of said partnership.

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









SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

**PART 1 - GENERAL**

**1.1 PROJECT INFORMATION**

- A. Project: Mt Pleasant School District – Westlake High School – Physical Education Department Renovation
- B. Project Location: Mt Pleasant, NY
- C. Owner: Mt Pleasant School District
- D. Architect: LAN Associates
- E. Construction Manager: Arris Contracting Company, Inc.
- F. The overall scope of work includes: Abatement, selective demolition, window replacements, locker room renovations, toilet room renovations, doors, ceilings, finishes, etc., plumbing work, HVAC upgrades, fire alarm, electric power, panelboard replacement, lighting, etc.

The contractor shall provide all labor, materials, equipment and services to furnish deliver and install all materials and related work as shown on the drawings, as required by these specifications and/or as directed by the Architect/Construction Manager.

G. Contracts:

- 1. The Project will be constructed under a multiple prime-contracting arrangement.
- 2. Prime Contacts are separate contracts between the Owner and separate contractors, representing significant construction activities. Each prime contact is performed concurrently with and closely coordinated with construction activities performed on the Project under other prime contracts. Prime contracts for this Project include.

- a. General Work Contract. (GC or GWC)
- b. Plumbing Contract. (PC)
- c. HVAC Contract. (MC, HVAC or HC)
- d. Electrical Contract. (EC)

**1.2 DIVISION OF WORK**

- A. Each contract shall include all labor materials, plans, tools, equipment and supervision which are required for or incidental to the proper completion of the work as indicated on the drawings and described in the following specification sections:

**1.3 GENERAL REQUIREMENTS – ALL CONTRACTS**

**DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS**

00 01 07	Seals
00 01 15	List of Drawings
00 11 13	Notice to Bidders
00 21 13	Instructions to Bidders
00 30 00	Existing Hazardous Material Information
00 30 01	Asbestos Report
00 30 02	Lead Report
00 40 00	Sexual Harassment Prevention Certification Form
00 40 01	Insurance Coverage Certification

SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

00 41 01	Forms to Be Submitted with Bid
00 41 02	Bid Proposal Form
00 41 16	Bid Form for Electrical Contractor
00 41 16	Bid Form for General Contractor
00 41 16	Bid Form for Mechanical Contractor
00 41 16	Bid Form for Plumbing Contractor
00 43 90	Surety's Consent
00 43 91	Certificate of Bidder
00 43 92	Qualifications of Bidders
00 43 93	Statement of Bidders Qualifications
00 43 94	Bidder's Personnel
00 43 95	Conflict of Interest Certificate
00 43 96	Form of Disclosure Certificate
00 43 97	Non-Collusion Affidavit
00 43 98	Certification of Compliance with the Iran Divestment Act
00 43 99	Declaration of Bidder's Inability to Provide Certification of Compliance with the Iran Divestment Act
00 45 03	Insurance Certification Form
00 45 21	Hold Harmless Agreement
00 46 43	Wage Rates
00 50 00	Owner Contractor Agreement
00 61 00	Bond Requirements
00 61 01	Bid Bond Form AIA 310-2010
00 61 02	Performance Bond Form AIA 312-2010
00 61 03	Payment Bond Form AIA 312-2010
00 63 00	Request for Information
00 63 01	RFI Form AIA G716-2004
00 70 00	General Conditions of the Contract for Construction
00 70 01	Requisition for Partial Waiver of Liens
00 70 02	Certified Payroll

**DIVISION 01 – GENERAL REQUIREMENTS**

01 10 00	Summary of Work
01 11 00	Milestone Schedule
01 21 00	Allowances
01 22 00	Unit Prices
01 25 00	Substitution Procedures
01 26 00	Contract Modification Procedures
01 29 00	Payment Procedures
01 31 00	Project Management and Coordination
01 31 50	COVID-19 Contractor Procedures
01 32 16	Construction Progress Schedule
01 32 33	Photographic Documentation
01 33 00	Submittal Procedures
01 40 00	Quality Requirements

SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

01 43 39 Mockup Requirements  
01 45 33 Code-Required Special Inspections  
01 50 00 Temporary Facilities and Controls  
01 60 00 Product Requirements  
01 73 00 Execution Requirements  
01 73 10 Cutting and Patching  
01 74 19 Construction Waste Management and Disposal  
01 74 23 Cleaning Up  
01 77 00 Close-Out Procedures  
01 77 01 Closeout Checklist  
01 78 23 Operation and Maintenance Data  
01 78 39 Project Record Documents  
01 91 13 General Commissioning Requirements

**CONTRACT #1 – GENERAL WORK CONTRACTOR**

**In addition to the General Requirements, Division 1, included in this bid package shall provide for proper completion of work as indicated on all drawings and in accordance with the terms and conditions described in the following specification sections.**

**DIVISION 2 – EXISTING CONDITIONS**

024119 – SELECTIVE DEMOLITION  
028200 – ASBESTOS ABATEMENT  
028300 – LEAD-BASED PAINT WORK PRACTICES

**DIVISION 3 - CONCRETE**

033000 – CAST IN PLACE CONCRETE  
035400 – CONCRETE UNDERLAYMENT PATCH  
035416 – CEMENT-BASED, INTERIOR, SELF-LEVELING UNDERLAYMENT

**DIVISION 4 - MASONRY**

040121 – UNIT MASONRY REPLACEMENT  
042200 – CONCRETE UNIT MASONRY  
047200 – CAST STONE MASONRY

**DIVISION 6 – WOOD AND PLASTICS**

061000 – ROUGH CARPENTRY  
061053 – MISCELLANEOUS ROUGH CARPENTRY  
062000 – FINISH CARPENTRY  
066116 – SOLID SURFACING FABRICATIONS

**DIVISION 7 – THERMAL AND MOISTURE PROTECTION**

078443 - FIRESTOPPING  
079000 – PRE-COMPRESSED EXPANSION JOINTS  
079200 – JOINT SEALANTS  
079513 – INTERIOR EXPANSION COVER ASSEMBLIES

SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

**DIVISION 8 - OPENINGS**

081113 – HOLLOW METAL DOORS AND FRAMES  
081416 – FLUSH WOOD DOORS  
081743 – FRP/ALUMINUM HYBRID DOORS  
083113 - ACCESS DOORS AND FRAMES  
085113 – ALUMINUM WINDOWS  
087100 – DOOR HARDWARE  
088100 – GLASS AND GLAZING  
088117 – FIRE RATED GLASS  
088813 – GLASS-FIRE RESISTANT GLAZING  
089000 – LOUVERS AND VENTS

**DIVISION 9 - FINISHES**

090561 – WATER VAPOR EMISSION CONTROL SYSTEM FOR CONCRETE SLABS  
092900 – GYPSUM BOARD  
095110 – ACOUSTIC CEILINGS  
096510 – RUBBER FLOORING  
096513 – RESILIENT BASE AND ACCESSORIES  
096723 – RESINOUS FLOORING  
099123 – INTERIOR PAINTING

**DIVISION 10 - SPECIALTIES**

101100 – VISUAL DISPLAY BOARDS  
101200 – DISPLAY CASES  
101419 – INTERIOR SIGNS  
102116 – TOILET PARTITIONS  
102800 - WASHROOM ACCESSORIES  
104400 – FIRE PROTECTION SPECIALTIES  
105113 – METAL ATHLETIC LOCKERS

**DIVISION 11 - EQUIPMENT**

116623 – GYMNASIUM PROTECTION ACCESSORIES

**DIVISION 12 - FURNISHINGS**

122124 – MANUAL ROLLER SHADE SYSTEM  
123554 – MANUFACTURED CASEWORK  
124813 - ENTRANCE FLOOR MATS AND FRAMES

Special Notes: Contract #1 – General Work Contractor:

1. General Work Contractor to carry insurance coverages per Article 10 in the General Conditions of the Contract for Construction which are located in the DIV O specification.
2. Work hours M-F 7:00AM – 4:30PM. Contractor will appropriately man the project to avoid Saturday and Overtime hours which result in Owner, Construction Manager and Architect additional costs.
3. Access doors furnished by trade requiring access; installation by Contract #1 – General Work Contractor.

SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

- 4. GC and subcontractors will not be allowed to use existing or new plumbing fixtures to wash out mortar pans, grout, adhesives, etc.**
5. GC is specifically notified that ALL floor areas will receive self-leveling underlayment. The thickness will vary due to ceramic tile removals, mud set removals, varying floor slab elevations from room to room, areas where chases removed, grind down high spots, etc. Contractor will review and bid accordingly to achieve a consistent flat and level floor at no additional cost to the owner.
6. General Contractor will chop/grind down existing concrete floor as necessary to install recessed walk-off mat located in the vestibule 130G.
7. GC will utilize lead-safe work practices as per Section 028300 – when impacting/removing/disposing of any lead containing items.
8. GC's abatement contractor will probe walls /investigate above the ceilings and walls to confirm presence or absence of fittings / insulation in concealed locations, prior to abatement.
9. GC is notified that phasing will require multiple mobilizations and multiple crews of various subcontractors.
10. GC will confirm compatibility in writing between his floor self-leveling and patching materials with the resinous and rubber floor manufacturers.
11. All staging area work (signage, parking areas, fence enclosures, etc.) indicated for staging area (located in section 015000) is by GC. Remove all temporary materials and restore all temporary roadways / staging surfaces at conclusion of the project.
12. GC to provide dust protections and a negative air environment to mitigate any dust and exhaust all work areas of any odors, fumes, etc. from the adjacent occupied school areas.
13. GC will install floor protections (utilizing heavy duty "Ram-Board" with taped joints, or equivalent) to protect finished floor surfaces from damage for all room areas and corridor access routes necessary for construction.
14. Contractor is specifically reminded about their responsibilities for clean-up as per section 017423. Maintaining a clean jobsite is considered a safety issue and will be strictly enforced. In addition to daily cleaning, the contractor is required to hire a professional cleaning company to final clean all areas impacted by the construction. This includes completely cleaning any surfaces/equipment/furniture which has been dusted by the construction work. If the contractor does not properly perform this function when directed by the Owner/CM, the owner will perform the work with others and deduct the cost from the contractor.

SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

**1.4 CONTRACT #2 – PLUMBING CONTRACTOR**

**In addition to the General Requirements, Division 1, included in this Plumbers bid package shall provide for proper completion of work as indicated on all drawings and in accordance with the terms and conditions described in the following specification sections.**

**DIVISION 2 – EXISTING CONDITIONS**

024119 – SELECTIVE DEMOLITION  
028300 – LEAD-BASED PAINT WORK PRACTICES

**DIVISION 3 - CONCRETE**

033000 – CAST IN PLACE CONCRETE ( patching of floor trenches )

**DIVISION 6 – WOOD AND PLASTICS**

061000 – ROUGH CARPENTRY

**DIVISION 7 – THERMAL AND MOISTURE PROTECTION**

078443 - FIRESTOPPING  
079200 – JOINT SEALANTS

**DIVISION 8 - OPENINGS**

083113 - ACCESS DOORS AND FRAMES

**DIVISION 22 - PLUMBING**

220000 – PLUMBING SUMMARY OF WORK  
220501 – BASIC PLUMBING MATERIALS AND METHODS  
220519 – METERS AND GAGES FOR PLUMBING PIPING  
220523 – PLUMBING VALVES  
220529 – HANGERS AND SUPPORTS FOR PLUMBING AND PIPING EQUIPMENT  
220548 – VIBRATION AND SEISMIC CONTROLS  
220553 – IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT  
220719 – PLUMBING PIPING INSULATION  
221116 – DOMESTIC WATER PIPING  
221119 – DOMESTIC WATER PIPING SPECIALTIES  
221316 – SANITARY WASTE AND VENT PIPING  
221319 – SANITARY WASTE AND VENT PIPING SPECIALTIES  
224213 – PLUMBING FIXTURES  
224716 – WATER COOLERS

Special Notes: Contract #2 – Plumbing Contract.

1. Plumbing Contractor to carry insurance coverages per Article 10 in the General Conditions of the Contract for Construction which are located in the DIV O specification.
2. Work hours M-F 7:00AM – 4:30PM. Contractor will appropriately man the project to avoid Saturday and Overtime hours which result in Owner, Construction Manager and Architect additional costs.

## SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

3. Access doors for plumbing items by PC; installation by Contract #1 – General Work Contractor.
4. All sanitary piping work (remove and replace) is by Plumbing contract whether located subslab, in crawl spaces or above ceilings.
5. ALL sawcut, excavation/backfill, (3/8 pea gravel, etc.), compaction and concrete infill for sub slab plumbing piping and roof drain relocations as shown on Plumbing drawings, A2.01 & A2.02 is by PC. (finish elevation height as required for floor finishes – coordinate with GC).
6. PC will utilize lead-safe work practices as per Section 028300 –when impacting/ removing / disposing of any lead containing items.
7. PC provides and installs Flushometers and drills holes for electrical conduit. PC supplies the associated transformer to the EC. All wiring by EC.
8. Any Solenoid valves supplied & installed by PC (wiring and connections by EC)
9. PC is responsible for making their own through wall, through floor/roof piping penetrations and associated patching/fire-stopping.
10. Contractor is specifically reminded about their responsibilities for clean-up as per section 017423. Maintaining a clean jobsite is considered a safety issue and will be strictly enforced. In addition to daily cleaning, the contractor is required to hire a professional cleaning company to final clean all areas impacted by the construction. This includes completely cleaning any surfaces/equipment/furniture which has been dusted by the construction work. If the contractor does not properly perform this function when directed by the Owner/CM, the owner will perform the work with others and deduct the cost from the contractor.

### 1.5 CONTRACT #3 – MECHANICAL CONTRACTOR

In addition to the General Requirements, Division 1, each Contract included in this bid package shall provide for proper completion of work as indicated on all drawings and in accordance with the terms and conditions described in the following specification sections.

#### DIVISION 2 – EXISTING CONDITIONS

024119 – SELECTIVE DEMOLITION

028300 – LEAD-BASED PAINT WORK PRACTICES

#### DIVISION 6 – WOOD AND PLASTICS

061000 – ROUGH CARPENTRY

#### DIVISION 7 – THERMAL AND MOISTURE PROTECTION

078443 - FIRESTOPPING

079200 – JOINT SEALANTS

SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

**DIVISION 8 - OPENINGS**

083113 - ACCESS DOORS AND FRAMES

089000 – LOUVERS AND VENTS

**DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING**

230000 – MECHANICAL SUMMARY OF WORK

230500 – COMMON WORK RESULTS FOR HVAC

230513 – COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

230519 – METERS AND GAGES FOR HVAC PIPING

260523 – GENERAL-DUTY VALVES FOR HVAC PIPING

230529 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

230548 – MECHANICAL VIBRATION AND SEISMIC CONTROLS

230553 – MECHANICAL IDENTIFICATION

230593 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

230713 – DUCT INSULATION

230714 – ACOUSTIC DUCT INSULATION

230719 – PIPING INSULATION

230993 – SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

232113 - HYDRONIC PIPING

232116 – HYDRONIC PIPING SPECIALTIES

232300 – REFRIGERANT PIPING

233113 – METAL DUCTS

233300 – AIR DUCT ACCESSORIES

233416 – CENTRIFUGAL HVAC FANS

233713 – DIFFUSERS, REGISTERS AND GRILLES

238126 – SPLIT-SYSTEM AIR-CONDITIONERS

238219 – FAN COIL UNITS

238236 – FINNED-TUBE RADIATION HEATERS

238239 – CABINET UNIT HEATERS

**DIVISION 26 – ELECTRICAL**

260519 - LOW-VOLTAGE ELECTRICAL POWER CABLES ( for control wiring)

Special Notes: Contract #3 – Mechanical (MC) Contractor:

1. Mechanical Contractor to carry insurance coverages per Article 10 in the General Conditions of the Contract for Construction which are located in the DIV O specification.
2. Work hours M-F 7:00AM – 4:30PM. Contractor will appropriately man the project to avoid Saturday and Overtime hours which result in Owner, Construction Manager and Architect additional costs.
3. Access doors are furnished by MC Contract #3 and installed by GC Contract #1.
4. All new roof curbs, roof rails, and pipe portals to be supplied and installed by MC Contract #3. This includes “new roof hole cut, wood blocking, install curb, flash in curb and provide temporary watertight/plywood secure of opening until HVAC units are set). MC will use roofing subcontractor who is certified by manufacturer to work on this roof and maintain existing warranty. ( See drawing A2.03 – All roofing work by MC ).

## SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

5. Any wood blocking for MC items by Contract #3 MC.
6. Any reinforcing associated with Mechanical work is by MC Contract # 3. This includes any steel angle supports beneath rooftop HVAC units, detail 14/M6.03, 1/M6.02, etc.
7. VFD's, disconnects, starters, etc. supplied by MC will be installed by EC, unless noted otherwise.
8. MC will utilize lead-safe work practices as per Section 028300 – if impacting/ removing / disposing of any lead containing items.
9. Removal of existing roof mounted HVAC items is by MC Contract #3. This includes infill decking and roof patch where applicable.
10. MC Contract #3 is responsible for making their own through wall and through floor duct/piping penetrations and associated patching/fire-stopping.
11. If any new mechanical units are too large to fit through existing openings the Mechanical contractor will either disassemble equipment into sections or remove existing construction to enlarge opening and reconstruct to match (at no additional cost).
12. Duct detectors supplied and wired by EC (MC installs the duct detector)
13. MC specifically notified construction is phased which necessitates that utilities/services will need to be temporarily connected and maintained as necessary to ensure that all occupied areas have the required services.
14. The MC is responsible for their own cutting / patching to match. This includes patch to match any voids left behind by HVAC removals. (Gym louver infills) MC will hire a skilled tradesman (asbestos worker, mason, carpenter, etc.) to perform this work.
15. Contractor is specifically reminded about their responsibilities for clean-up as per section 017423. Maintaining a clean jobsite is considered a safety issue and will be strictly enforced. In addition to daily cleaning, the contractor is required to hire a professional cleaning company to final clean all areas impacted by the construction. This includes completely cleaning any surfaces/equipment/furniture which has been dusted by the construction work. If the contractor does not properly perform this function when directed by the Owner/CM, the owner will perform the work with others and deduct the cost from the contractor.

### 1.6 CONTRACT #4 – ELECTRICAL

In addition to the General Requirements, Division 1, each Contract included in this bid package shall provide for proper completion of work as indicated on all drawings and in accordance with the terms and conditions described in the following specification sections.

#### DIVISION 2 – EXISTING CONDITIONS

024119 – SELECTIVE DEMOLITION

028300 – LEAD-BASED PAINT WORK PRACTICES

#### DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

078443 - FIRESTOPPING

**DIVISION 8 - OPENINGS**

083113 - ACCESS DOORS AND FRAMES

**DIVISION 26 - ELECTRICAL**

260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES  
260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS  
260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS  
260533 – RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS  
260553 – IDENTIFICATION FOR ELECTRICAL SYSTEMS  
260923 – LIGHTING CONTROL DEVICES  
262726 – WIRING DEVICES  
262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS  
265100 – INTERIOR LIGHTING

**DIVISION 27 - COMMUNICATIONS**

270000 – COMMUNICATION  
270500 – COMMON WORK RESULTS FOR COMMUNICATIONS  
270526 – GROUNDING AND BONDING FOR COMMUNICATIONS  
270528 – PATHWAYS FOR COMMUNICATIONS SYSTEMS  
271000 – STRUCTURED CABLING  
271100 – COMMUNICATIONS EQUIPMENT ROOM FITTINGS  
271300 – COMMUNICATIONS BACKBONE CABLING  
271500 – COMMUNICATIONS HORIZONTAL CABLING  
272000 – DATA COMMUNICATIONS  
272100 – DATA COMMUNICATIONS NETWORK EQUIPMENT  
272102 – DATA SYSTEMS  
276600 – COMMUNICATIONS EQUIPMENT ROOMS AND FITTINGS

**DIVISION 28 – ELECTRONIC SAFETY AND SECURITY**

280513 – CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY  
283111 – DIGITAL, ADDRESSABLE FIRE ALARM SYSTEM

Special Notes: Contract #4 – Electrical Contract

1. Electrical Contractor to carry insurance coverages per Article 10 in the General Conditions of the Contract for Construction which are located in the DIV O specification.
2. Work hours M-F 7:00AM – 4:30PM. Contractor will appropriately man the project to avoid Saturday and Overtime hours which result in Owner, Construction Manager and Architect additional costs.
3. Access doors are furnished by Electrical Contract #4 and installed by GC Contract #1.
4. Any existing ceiling removal/replacements necessary to install new electrical work to be done by Electric Contract #4. (e.g. – new conduits for feeders through existing ceilings, etc.)
5. VFD's, disconnects, motor starters, etc. which are supplied by MC will be installed by EC, unless noted otherwise.

SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

6. Any wood blocking or panel backboards for electrical items by EC contract #4
7. The EC will remove any ceiling mounted electrical items, Light Fixtures, FA devices, Speakers, WAP, exit signs, cameras, etc. EC to reinstall after new ceilings are completed.
8. After GC ceiling removals for areas scheduled to receive new acoustic grid/tile, the EC will properly tie up any existing sagging wires scheduled to remain at 6' O.C. to be supported above the ceiling grid in accordance with code.
9. For Plumbers flushometers: the EC will install the PC provided transformer above the ceiling and install the wire to in-wall box. The EC then makes the wire connection from the electrical in -wall box to the flushometer.
10. EC will utilize lead-safe work practices as per Section 028300 – if impacting/ removing / disposing of any lead containing items.
11. Any Solenoid valves supplied & installed by PC – wiring and connections by EC
12. EC to provide and wire duct detectors (MC install the duct detector)
13. EC specifically notified construction is phased which necessitates that utilities & services will need to be temporarily connected and maintained as necessary to ensure that all occupied areas have the required services. (power, fire alarm/ PA)
14. Contractor is specifically reminded about their responsibilities for clean-up as per section 017423. Maintaining a clean jobsite is considered a safety issue and will be strictly enforced. In addition to daily cleaning, the contractor is required to hire a professional cleaning company to final clean all areas impacted by the construction. This includes completely cleaning any surfaces/equipment/furniture which has been dusted by the construction work. If the contractor does not properly perform this function when directed by the Owner/CM, the owner will perform the work with others and deduct the cost from the contractor.

**1.7 PRIME CONTRACTOR'S USE OF PREMISES**

Use of the Site: Limit use of the premises to work in areas indicated. Confine operations areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the work is indicated.

Owner Occupancy: Allow for Owner occupancy, work by other owner contractors and use by the public.

Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

Delivery blackout times – No contractor trucks / deliveries are allowed during school bus times 8:00AM – 9:30AM or 2:00PM – 3:30PM.

Existing building spaces may not be used for storage unless approved by the CM and Owner.

SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

Time Restrictions: Working hours M-F 7:00AM – 4:30PM.

Owner's representative(s) will cover the project for the standard 8-hour Monday-Friday shift. If contractor requests additional hours to make up schedule time or weekends, he will need to reimburse owner for any additional coverage or costs (e.g. – Architect, Construction Manager, Custodian, and Security) at their contractual rate.

No contractor work will be allowed during testing / ELA/ regents time periods. No additional costs to owner for not working during these testing times. Exact dates are not known at this time, contractor shall figure 8 days.

Contractors shall comply with Local Noise Ordinance. Work disrupting the community must be performed with the following hours:

General: Limitations on site usage as well as specific requirements that impact utilization are indicated on the drawings and by other contract documents. In addition to these limitations and requirements, the Contractor shall administer allocation of available space equitably among the separate sub contactors and other entities needing access and space, so as to produce the best overall efficiency in performance of the total work of the project. The Contractor shall schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.

Only materials and equipment, which are to be used directly in the work, shall be brought to and stored on the project site by the Contractor. After equipment is no longer required for the work, it shall be promptly removed from the project site. Protection of construction materials and equipment stored at the project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractors.

Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated. If additional storage is necessary, obtain and pay for such storage off-site.

The Contractor(s) and any entity for which the Contractor is responsible shall not erect any sign of the Project site without the prior written consent of the Owner, which may be withheld in the sole discretion of the Owner.

Contractor shall ensure that the work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the work and all adjacent areas. The work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the work shall be free from all debris, building materials and equipment likely to cause hazardous conditions. Without limitation of any other provision of the Contract Documents, contractor shall use its best efforts to minimize any interference with the occupancy or beneficial use of: Any areas and buildings adjacent to the site of the work or; The Building in the event of partial occupancy.

Without prior approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitations, lavatories, toilets, entrances and parking areas other than those designated by the Owner. Without limitation of any other provision of the Contract Documents, the Contractor shall use its best efforts to comply with the rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project Site, and the Building, as amended from time to time. The Contractor shall immediately notify the Owner in writing if during the performance of the Work, the Contractor finds compliance with any portion of such rules and regulations to be impracticable, setting forth

## SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

the problems of such compliance and suggesting alternatives through which the same results intended by such portions of the rules and regulations can be achieved. The Owner may, in the Owner's sole discretion, adopt such suggestions, develop new alternatives or require compliance with the existing requirements of the rules and regulations. The Contractor shall also comply with all insurance requirements, applicable to use, and occupancy of the Project Site and the Building.

Maintain the existing building in a safe and weathertight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period. When work is scheduled after hours clean and remove all temporary barriers and protection so that the building can be occupied the following day when normal building occupancy will occur.

Each Prime contractor is responsible for maintaining a safe jobsite. This include actively reviewing their work areas to ensure that they are in compliance with all required OSHA regulations. It is a contract requirement that each contractor conducts weekly tool-box safety meetings to insure that their employees are properly educated and utilizing safe work practices. (Copies of these weekly meetings and a list of the attendees will be forwarded to the CM site superintendent on a weekly basis). Contractors will comply with all requirements outlined in Article 7 of the General Conditions including providing their employees with PPE (personal protective equipment), such as hard hats, proper work boots, safety harness, safety glasses, etc.

Keep public areas such as hallways, stairs, elevator lobbies and toilet rooms free from accumulation of waste material, rubbish or construction debris.

Smoking, drinking of alcoholic beverages or open fires will not be permitted on the project site.

Utility Outages and Shutdown:

- a. Limit disruption of utility services to hours the building is unoccupied, weekends or holidays at no additional cost.
- b. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Mt Pleasant Central School District and authorities having jurisdiction.
- c. Prevent accidental disruption of utility services to other facilities.
- d. All costs for manning of temporary shutdowns and utility crossovers, including 24-hour fire watch if necessary, is included in the contractor's bid regardless of weekend, holiday, etc.

### 1.8 OCCUPANCY REQUIREMENTS

**Full Owner Occupancy:** The Owner will occupy the site and existing building during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with the Owner's operations.

**Partial owner Occupancy:** The Owner reserves the right to occupy the place and install equipment in completed areas of the work prior to Substantial Completion, provided such occupancy does not interfere with completion of the Work, Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

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The Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner occupancy.

Obtain a Certificate of Occupancy from local building officials prior to Owner occupancy.

Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy, the Owner will operate and maintain mechanical and electrical systems serving occupied portions of the building.

Upon occupancy, the Owner will assume responsibility for maintenance and custodial service for occupied portions of the building.

### 1.9 PRODUCTS ORDERED IN ADVANCE

None

### 1.10 DEFINITIONS

Definitions as applied to “Contractors” involved with the work of this Project:

“The Contractor” or “Contractor” meaning that Respective Prime Contractor normally responsible for that work referenced;

“Respective Prime Contractor” meaning either the – General Contractor, Plumbing, HVAC or Electrical Contractors normally responsible for the referenced work;

“Trade Contractor” meaning that Respective Prime Contractor as above; and such other terms relating to Contractors to be taken in context with respect to referenced work.

Further, wherein said Division 0 and 1 and respective Sections therein, any reference is made to “General Contractor”, same shall be construed to mean “Contractor for the General Construction, or General Work Contractor”.

The Architect cannot guarantee the correctness of the existing conditions shown and assumes no responsibility therefore, it shall be the responsibility of the Contractor to visit the site and verify all existing conditions prior to bid.

The Owner will purchase certain items required for the overall operation of this facility.

The Contractor(s) will cooperate with said vendors as may be necessary to permit the work to be accomplished.

- a. The cooperation may extend to the receiving, unloading and placement of said equipment if directed by the Owner.
- b. Terms of payment, if any, shall be in accordance with the General Conditions as amended or modified.
- c. Each Contractor is advised that the Owner may enter into separate contracts as may be in their best interest.
- d. Each Contractor is further advised that there will be a full on-site Project Representative / Construction Manager, whose duties will be defined at the pre-construction meeting.

### ADDITIONAL SECURITY PROVISIONS.

SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

1. All Contractors' employees shall use a single means of access and egress, except in the case of emergency, to be designated by the Construction Manager.
2. Each Contractor and each Subcontractor shall require his employees, while on the job site, to wear, in a conspicuous location, a photo I.D. button bearing the name of the employee and the Contractor. The buttons of each Contractor shall be numbered consecutively. An up-to-date list of all I.D. buttons, indicating the name and number for each employee, shall be furnished to the Construction Manager.

**1.12 ASBESTOS AND LEAD PAINT AWARENESS REQUIREMENTS**

Contractor agrees not to use or permit the use of any asbestos containing material in or on any property belonging to the Owner.

For purposes of this requirement, asbestos free shall mean free from all forms of asbestos, including - actinolite, amosite, anthrophyllite, chrysotile, cricidolite and tremolite, both in friable and non-friable states and without regard to the purposes for which such material is used.

Reference Abatement Sections of these documents for procedures and protocols to be followed in the event of discovery of any suspect asbestos, lead or hazardous materials.

Contractors will investigate / verify then carefully demolish existing ceiling and/or wall items so as not to disturb any asbestos containing fittings and / or insulation which may be located above existing ceilings or inside walls.

**1.13 CONSTRUCTION TIME AND PHASING REQUIREMENTS**

Each Contractor is advised the "time is of the essence" of the Contract as defined in Article 13 of the "General Conditions" for the completion of the construction of the facility. It is understood that the work is to be carried through to completion with the utmost speed consistent with good workmanship.

Time of Completion shall be as established in the Milestone Schedules (Section 011100).

Further, safe and legal ingress and egress shall be maintained at all times to and through the occupied portions of the construction site.

Work shall proceed in such a manner as to cause the least amount of disruption to the ongoing operations as possible.

**COORDINATE CLOSELY WITH SCHOOL OPERATING PERSONNEL.**

All work and storage areas shall be completely enclosed by a fence or barricade at all times so that no student or the public can approach the area or the equipment.

The Contractor shall maintain fences and barricades at all times and shall repair/ restore and/ or pay for any temporary fencing damaged by their work.

Maintain at all times, all exits and walkways.

Where the barricade is removed for work, the Contractor performing such work shall provide adequate safety personnel to prevent unauthorized persons from approaching the work area.

SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

Construction Phasing

The phasing and/ or milestone schedule contained in Section 011100 has been established for the overall construction of the project.

Each Contractor is advised that areas of the existing buildings which are to be added to and / or altered under this Contract will remain in use during construction, coordinate with Section 015000 for temporary facilities.

Electrical and mechanical services to the functioning spaces shall be maintained at all times.

Swing-overs to new facilities shall be made so as to cause the least interruption to the facilities' operations.

The Contractor shall provide and maintain all required separations between old and new construction to prevent: Unauthorized entrance to construction areas by others than Architect, Construction Manager or Owner , heat loss from existing building , water ( rain or ground ) infiltration into existing building.

Exterior alteration and restoration, as required, may proceed outside of phasing schedule at the Contractor's option with concurrence from the Architect, Construction Manager and Owner.

Site development work shall proceed in such a manner to cause the least amount of disruption to the ongoing operations as possible.

**1.14 PROOF OF ORDERS AND DELIVERY DATES - Coordinate with Sections 013300 and 013216.**

Within 2 weeks after the approval of shop drawings, samples, product data and the like, the Contractor shall provide copies of purchase orders for all equipment and materials which are not available in local stock. The Contractor shall submit written statements from suppliers confirming the orders and stating promised delivery dates. Failure to provide this critical information will result in Owner holding monthly requisition payments until received.

**Due to COVID-19 and it's potential to disrupt material supply-chains, the contractors are required to obtain all materials for the project and store them onsite in their individual Conex boxes. This includes general material items typically readily available (piping, conduits, wire, metal studs, ceiling, etc.). The owner will pay for these stored items delivered to the jobsite in accordance Section 012900.**

This information shall be incorporated within the progress schedules so required as part of Section 013216 and 013300 and shall be monitored so as to ensure compliance with promised dates.

INTENT OF DOCUMENTS – See General Conditions for resolution of conflicts between drawings and specifications.

In the event of conflict, ambiguity and/or unclear circumstances between any of the requirements of the Contract Documents, the requirement that is most inclusive and of highest quality, quantity, and/or cost shall govern. The Contractor shall (1) provide the better quality or greater quantity of Work and/or (2) comply with the more stringent requirement; either or both in

## SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

accordance with the Architect's interpretation. The Contractor herewith agrees that no extra compensation shall be awarded to him based upon a claim of conflict, ambiguity or unclear circumstances in the Contract Documents. See the General Conditions for greater detail.

### 1.15 FIELD MEASUREMENTS

Each Respective Contractor shall take all necessary field measurements prior to fabrication and installation of work and shall assume complete responsibility for accuracy of same.

This project is an ALTERATION and therefore necessitates additional attention to existing conditions receiving newly fabricated and installed equipment, i.e. note the requirements for field dimensioning of shop fabricated items whether or not so required by each technical section.

### 1.16 INITIAL SUBMITTAL REQUIREMENTS

As outlined in Division 01, each Contractor shall provide items noted including - bonds, insurance, emergency telephone numbers, progress scheduling, schedules of submittals, subcontractor listings and the like prior to the start of any work. The owner will not issue contracts until all bonds and insurance information is received by the contractor and verified correct.

### 1.17 SCHEDULES

The milestone schedule presented in the documents is for bidding and general purposes. Due to the nature of the work, it is the intention of the Construction Manager to negotiate actual work periods for the project among the various Prime Contractors involved with this bidding process, as well as separate contractors involved with other phases of the work solicited under separate proposals. Each Contractor shall, under terms of the General Conditions, mutually cooperate in the rescheduling of work to permit an uninterrupted use of the facilities by the Owner, without additional cost to the Owner.

General:

1. The objective of this project is to complete the overall work in the shortest period of time and to protect the building and occupants from damages caused by weather and construction activity during the progress of the work.
2. To meet these objectives, the Contractor shall plan the work, obtain materials, and execute the construction in the most expeditious manner possible in accordance with the requirements listed below.
3. If the Contractor fails to expedite and pursue any part of the work, the Owner may terminate the contract as per Article 17 or may carry out the work with others per the General Conditions.
4. The Contractor shall work in coordination with work of other Contractors and with school activities with special attention to noise, dust, safety and other contract requirements for work in and around the occupied buildings.

## SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

5. All contractors are required to comply with proper sequencing of work and provide other prime contractors sufficient time to install their work (e/g/-metal stud walls get fully framed; MEP contractors perform roughing/testing/inspections; then walls are sheathed with gypsum – no sheetrocking one side unless CM approved). If contractor “boxes out” another prime contractor, he will be directed to stop work and open if necessary, to enable other trades to complete their work. No compensation for lost time due to stop-work will be provided.

Milestone Schedule (See Section 01 11 00).

### **1.18 ADDITIONAL REQUIREMENTS**

The following are additional general and special requirements which will govern the work of the projects covered by these Documents.

1. If it appears that some of the work cannot be completed by the scheduled date, the Contractor shall increase the work force or increase the hours of work, including evenings and weekends as necessary, and cover any additional costs to the Owner, architect and Construction Manager.
2. If the work is complete but the area is not cleaned and debris or equipment is not removed, the Owner shall have the right to prepare the area for occupancy with his own forces and deduct the costs from the Contract Amount. (If Contractor does not respond within 4 hours notice).
3. If the Contractor fails to staff the job adequately to meet the completion date, the Owner reserves the right to assume possession of the material and complete installation with the Owner's forces or other Contractors or to require the Contractor to work evenings and weekends at no additional cost.
4. The school can be made available on weekends and evenings to allow the Contractor adequate time to complete the work before final completion date. Any custodial or Construction Manager costs resulting in this after-hours scheduling will be the Contractor's responsibility as their contractual hourly rate.
5. In addition to the above-stated requirements for phasing of the work, the Contractors shall not do any noisy work in the areas where examinations will be conducted as per the published school calendar.
6. Work in each work period shall progress at least at a pace in proportion to the Contract time available.
7. The Contractor is responsible for temporary protection of all work until acceptance.
8. The school will be closed on Saturdays, Sundays, regularly schedules district holidays, and at night after cleaning crews have finished.
9. If any contractor wishes to work at any time when the school is normally closed, that Contractor shall arrange and pay for custodial services for the building at the applicable district pay rates.
10. All existing conditions must be verified in the field. The Owner takes no responsibility for actual conditions found deviating from the drawings. If existing condition interferes with contract work, contractor is responsible to eliminate this condition.
11. Contractor must plan, provide and maintain his own access, ramping, and egress as required into and out of the site, staging of trailer(s), materials, machinery, and equipment in agreement with the Construction Manager's Superintendent. Maintain free and safe access on the jobsite for other related project personnel. Maintain safe pedestrian or vehicular traffic

SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

must be regulated by a flagman. Trucking and delivery operation should be coordinated with Construction Manager's Superintendent and all other trades.

12. Contractor is responsible for all work shown on Contract Documents, including drawings of other trade disciplines. For example, the HVAC Contractor will be responsible for HVAC work shown on Architectural Drawings.
13. Contractor is responsible to maintain existing site fencing in its existing condition. Modifications to the fence to better accommodate the contract work can be discussed with the Construction Manager. These changes shall then be handled by this contractor at his expense and in accordance with the Construction Manager's Superintendent's direction. Any cost incurred as a result of damages shall be charged to this contractor.
14. Contractor's personnel will not be permitted to use Mt Pleasant Central School District's facilities (including toilet, telephone, food services, etc.) for their own benefit. Contractors' Superintendent must explain this to all their field forces.
15. Time is of the essence. Contractors' proposed schedule must be approved by the Construction Manager. Contractor shall indicate significant events such as submittals, shop drawings, material ordering, fabrication, delivery, coordination precedents, installation, testing and turnover by area or system as agreed with Construction Manager. A revised progress status shall be required on a weekly basis.
16. Decisions required from the Construction Manager, Architect and/or Engineer, shall be anticipated by the Contractor to provide ample time for inspection, investigation or detailed drawings.
17. Contractor shall limit his operations including storage of materials and prefabrication to areas within the Contract Limit Lines unless otherwise permitted by the Construction Manager at the Owner's option.
18. Contractor shall coordinate the use of premises with the Owner and Construction Manager and shall move at his own expense any stored products under Contractor's control, including excavated material, which interfere with operations of the Owner or separate contractors.
19. Contractor shall obtain and pay for the use of additional storage of work areas needed for operations.
20. Contractor shall assume full responsibility for the protection and safekeeping of products under this Contract stored on the site and shall cooperate with the Construction Manager to insure security for the Owner's Property.
21. The intention of the work is to follow a logical sequence; however, the Contractor may be required by Construction Manager to temporarily omit or leave out any section of his work, or perform his work out of sequence. All such out of sequence work and come back time to these areas shall be performed at no additional cost.
22. Contractor shall submit a three-week schedule (man-loaded by work activity and area) to Construction Manager each week. Contractor's representative shall attend a weekly meeting with all contractors, chaired by Construction Manager, for the purpose of job coordination and sequencing. Contractor is responsible to coordinate the job with other trades and Construction Manager, and to cooperate with other trades in pursuit of the overall project's shop drawings and actively participate in resolving discrepancies, conflicts, interferences, etc.
23. Each Prime Contractor shall prepare an overall job schedule for his portion of work upon award of Contract, as per section 013216 - Construction Schedules.

SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

24. Sufficient manpower shall be provided at all times to maintain progress of the job. A shortage of labor in the industry shall not be accepted as an excuse for not properly manning the job.
25. The contractor shall take special care in verifying that his equipment matches the characteristics of the power being supplied.
26. Any contractor personnel including project managers, supervisors, etc who engage in any personal attacks, belligerent or threatening speech/texts, etc., to the owner, or any of its agents, will be removed from working on the project.
27. Insubordination, unsafe practices, horseplay, abusive behavior or language, wanton destruction of property, use of drugs or alcohol, possession of firearms, and solicitation shall not be tolerated. There will be no warnings, and Contractor shall designate a responsible on-site supervisor to handle any situations that may arise, including termination.
28. Each contractor is responsible to supply and install all wood blocking/bracing necessary to properly secure their work. This responsibility includes coordinating the installation in concealed areas without delaying other trades.
29. Union business shall not be conducted on site. Any Union representatives that visit the site must declare what Contractor's personnel they represent, and must be escorted by that Contractor's Union steward at all times. No visitors, sales representative or non-working personnel shall be permitted on site without prior consent of the Construction Manager. No photographs shall be taken without the Construction Manager's prior approval.
30. Organize daily clean ups as well as participating in a weekly joint clean up involving all prime contractors onsite. Clean up shall be considered a safety issue. If any contractor fails to keep the site safe and brook clean within 4 hours of being notified by the Construction Manager, either verbally or in writing, the Construction Manager will have the cleanup work performed by others and will back charge accordingly.
31. Contractor shall provide protection from damage to adjacent and adjoining work and/or structures. Contractor shall clean, repair and/or replace any damage for which this contractor is responsible.
32. Contractor shall submit hourly rate sheets that would apply to time and material work for all pertinent trades upon Award of Contract.
33. Contractor shall examine surfaces and conditions prior to start of work. Report unacceptable conditions to the Construction Manager. Do not proceed until unacceptable conditions are corrected and acceptable. Starting of work implies acceptance.
34. Upon removal of exterior walls and window units, the building security and weather protection is the responsibility of the prime contractor performing the removals.
35. Each Prime Contractor shall include general housekeeping of light debris. All debris from each Prime Contractor will be collected daily and disposed of into their dumpsters. **In addition to daily general housekeeping, the General Work Contractor (Contract #1) shall provide a weekly broom sweep and damp mop of all areas for the entire duration of the project.** The broom sweep shall include debris from all trades working on site.
36. It is the responsibilities of all Prime Contractors to review the entire summary of work and remaining documents for additional work items.
37. SLEEVES AND SLEEVE LAYOUT - It is the responsibility of the Prime Contractor requiring a sleeve to provide the sleeve and a layout sketch to the Prime Contractor performing the construction activity that the sleeve goes in.
38. Each contractor is responsible to review and become familiar with the scope of work included in all Contracts.

SECTION 01 10 00 – SUMMARY OF WORK (MULTIPLE PRIME CONTRACTS)

39. Limited site space is available in areas as designated by the Construction Manager. Construction trade parking is not permitted in Owner's employee parking lot.
40. Each contractor shall provide the engineering layout required to properly complete his work from an established working point. Contractor shall employ only competent engineering personnel skilled in performing layout tasks of similar complexity.
41. Prior to commencing the work, each Contractor shall provide written acceptance of grades, structures, substrates, and/or systems installed by other Contractors as suitable for installation of his work. Failure to provide this verification prior to commencing work shall constitute acceptance of the existing conditions.
42. Each Contractor shall coordinate with the Construction Manager for lay down areas, staging areas, and overall use of project site.
43. All contractors and their employees, subcontractors and supplier are expressly prohibited from entering the occupied areas of the school buildings during school hours without prior written permission of the Construction Manager and for using any of its facilities (i.e. restrooms, cafeteria, etc.).
44. Each contractor is responsible for the timely provision of the information required by other Contractors for the progress of other Contractors' work.
45. All contractor foremen must have working cell phone and number provided to CM.
46. No recycled import fill materials are permitted.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 011000



SECTION 01 11 00 – MILESTONE SCHEDULE

**PART 1 - GENERAL**

1.1 Milestone

The following milestone schedule serves as a basis for bidding. A Master Schedule will be developed at a general meeting with each of the low bidders within 21 days of Letter of Intent to Award the Contracts. Each prime contractor will coordinate activities, forward submittals, deliver materials and provide necessary manpower to meet the milestones listed below.

1.2 Milestone Schedule

<b>Westlake High School Physical Education Dept. Renovations</b>	Start	Finish
<ul style="list-style-type: none"> <li>All Abatement Areas (inc. final air clearance) Multiple Crews, work weekend /double shift if necessary, for full air clearance by July 1st.</li> </ul>	6/25/21	7/1/21
<ul style="list-style-type: none"> <li>Office Area Renovations – East side</li> </ul>	7/02/21	10/29/21
<ul style="list-style-type: none"> <li>Locker Room Renovations – West side</li> </ul>	7/02/21	11/15/21

Contractor is specifically notified that they will need to work multiple crews simultaneously in order to meet the production rates and complete the work (M-F workweek) by the above completion dates.

The objective of this project is to complete the overall work in the shortest period of time. Thus, if access is provided to a work area sooner than originally scheduled, each contractor will likewise mobilize their forces earlier to maintain the reduction in overall schedule time. Each Contractor is advised that “Time is of the essence” as per Article 13 of the General Conditions and they will work with multiple crews of sufficient size as necessary to carry out the work with the utmost speed with good workmanship. If the contractor fails to expedite and pursue any part of the work, the Owner may order the contractor to take “Extraordinary Measures” as per Article 13, or hire others to complete the work and adjust their contract amount accordingly as per Articles 14 and 17.

The abatement schedule for the existing renovation areas is critical to all prime contractors meeting their installation schedule. The GC will have multiple abatement crews working simultaneously in all areas to ensure final air clearance by the date indicated.

Contractors are specifically notified that they must properly man the project with a full time competent field superintendent and a sufficient supply of tradesmen to maintain progress and flow of work as required by schedule and to coordinate/install timely for other trades.

All trades are specifically notified that construction is phased for the two locker room renovation areas and thus requires separate mobilizations for certain trades. Additionally, utilities/services may need to be temporarily disconnected/connected and maintained as necessary to ensure that all occupied areas have the required services without interruption (mechanical, electrical, fire alarm, PA, etc.).

All work required by any of the Owner’s representatives and consultants, including the Construction Manager, Architect, Architect’s consultants, Owner’s Attorneys, etc., to execute final the contract beyond Milestone dates, or to execute final closeout after 30 days past substantial completion, if determined to be caused by contractor, shall result in payment(s) to the Owner for additional services to the Construction Manager, Architect, Architect’s consultants, Owner’s Attorneys, etc. These costs will then be issued in the form of a deduct change order to the contractor’s contract at the Owners consultants’ contractual rate.

Products & Execution (Not Applicable)

END OF SECTION



SECTION 01 21 00 - ALLOWANCES

PART 1 - GENERAL  
RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

SUMMARY

B. This Section includes administrative and procedural requirements governing allowances. Selected materials and equipment are specified in the Contract Documents by allowances. In some cases, these allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

C. Types of allowances include the following:

- a) Contingency allowances.
- b) Quantity allowances

D. Related Sections: The following Sections contain requirements that relate to this Section:

Division 1 Section "Modification Procedures" specifies procedures for submitting and handling Change Orders.

Division 1 Section "Quality Control Services" specifies procedures governing the use of allowances for inspection and testing.

SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show the actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C.

CONTINGENCY & QUANTITY ALLOWANCES

D. Use the contingency allowance only as directed for the Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

E. The Contractor's overhead and profit, including costs for bonds and insurance, delivery, equipment rental and similar costs, for these allowances shall be included in the values of the general requirements of contract sum and are not chargeable under allowance disbursement.

F. At Project closeout, credit unused amounts remaining in the contingency allowance to the Owner by Change Order.

G.

UNUSED MATERIALS

H. Return unused materials to the manufacturer or supplier for credit to the Owner, after installation has been completed and accepted.

When requested by the Architect, prepare unused material for storage by Owner where it is not economically practical to return the material for credit. When directed by the

SECTION 01 21 00 - ALLOWANCES

Architect, deliver unused material to the Owner's storage space. Otherwise, disposal of unused material is the Contractor's responsibility.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION  
EXAMINATION

I. Examine products covered by an allowance promptly upon delivery for damage or defects.

J.  
PREPARATION

K. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

SCHEDULE OF ALLOWANCES

L. CONTRACT 1- General Work Contractor:

Allowance GC-1: Contractor shall include a contingency allowance of **\$ 30,000.00** for use according to the Owner's Instructions.

Allowance GC-2: Asbestos Fittings - in addition to the base bid abatement work identified on Abatement drawings the Contractor shall include in their base bid an allowance of 20 ea. fittings (Figure individual glove bag removal) for abatement of any additional Asbestos Fittings encountered.

M. CONTRACT 2- Plumbing Contractor:

Allowance PC-1: Contractor shall include a contingency allowance of **\$ 20,000.00** for use according to the Owner's Instructions.

N. CONTRACT 3- Mechanical Contractor:

Allowance MC-1: Contractor shall include a contingency allowance of **\$ 15,000.00** for use according to the Owner's Instructions.

O. CONTRACT 4- Electrical Contractor:

Allowance EC-1: Contractor shall include a contingency allowance of **\$ 15,000.00** for use according to the Owner's Instructions.

END OF SECTION

## SECTION 012200 – UNIT PRICES

### PART 1 - GENERAL

#### DESCRIPTION

- A. This Section specifies the requirements for measurements and records made for payment purposes and describes the item(s) under which payment(s) will be made for the Work performed under this Contract.
- B. All work shown or specified in the Contract Documents shall be performed.
- C. Items not specified to be measured or paid for (for which no specific pay item exists in the Price Schedule) shall be included in an appropriate unit price item or in a lump-sum item.

#### MEASUREMENT REQUIREMENTS

- A. All required measurements shall be made by the Contractor with the Engineer.
- B. Any measurements not witnessed by Engineer and which cannot be verified or substantiated by Engineer will not be approved and payment under the item(s) requiring such measurements will not be made.
- C. Coordinate measurements monthly, for the preparation of periodic pay estimates.
- D. Where payments will be made for removing rock and existing materials, notify Engineer so that he may witness the measurements.
  - 1. All materials removed without conforming to the above procedures, which Engineer cannot verify or substantiate, will not be paid for.
  - 2. Maintain complete, neat, clean, and legible field notes for all measured items.
  - 3. Notes shall contain spaces for Contractor's and Engineer's signatures plus additional space for comments.
  - 4. An original and a carbon copy shall be made for all notes and one copy shall be turned over to Engineer daily.
  - 5. The Engineer's signature shall not be constituted as an acceptance of the work, or the measurements made, but shall mean that he was present when the measurements were made.

#### SUBMITTALS

- A. See Section 013300.
- B. See Section 012300.
- C. Field notes of all measurements for payment purposes delivered to Engineer daily.
- D. Copies of all invoices required for payments out of cash allowance(s).
- E. Monthly Applications for Payment.
- F. Record Drawings showing the locations and quantities of all items measured for payment purposes.

## **SCHEDULING**

- A. Notify Engineer, as far in advance as possible, of the recording of measurements so that Engineer may observe existing conditions, work being performed, and measurements being made.
- B. Allow for and afford Engineer ample time, space, and equipment to observe measurements and to verify measurements and elevations.

## **PART 2 - PRODUCTS**

### **GENERAL**

- A. Provide all labor, materials, facilities, levels, measuring devices and all other equipment and items necessary to properly and accurately perform all measurements for payment purposes.
- B. Payment for certain items not specifically listed in the bid forms but otherwise required by the technical specifications shall be deemed included as part of the General Conditions and the individual unit price and lump sum bid items provided for in the proposal.

## **PART 3 – EXECUTION**

### **GENERAL**

- A. Perform all measuring required under this Section.
- B. Record all measurements and calculated quantities on the Record Drawings.
- C. No measurement shall be made for work performed within the limits of Lump Sum Items.

## **PART 3.1 - UNIT PRICE SCHEDULE**

### **General Contractor**

- A. Contract 1a (GC): Unit Price #1 - Asbestos Abatement - Minor tent enclosure for additional abatement areas:  
Contractor to provide a unit price for the installation, use and removal of a “minor” tent enclosure to perform asbestos abatement. Refer to Specification Section 028200. Unit price to be per enclosure and shall include all required prep work.
- B. Contract 1a (GC): Unit Price #2 - Asbestos Abatement - Minor tent enclosure for pipe elbow abatement:  
Contractor to provide a unit price for the installation, use and removal of a “minor” tent enclosure for the abatement of pipe elbows (MJP). Refer to Specification Section 028200. Unit price to be per enclosure and shall include all required prep work.
- C. Contract 1a (GC): Unit Price #3 - Asbestos Abatement - Minor tent enclosure for probes:  
Contractor to provide a unit price for the installation, use and removal of a “minor” tent enclosure to perform asbestos abatement probes. Refer to Specification Section 028200. Unit price to be per enclosure and shall include all required prep work.

**Mechanical Contractor**

**NONE**

**Electrical Contractor**

**NONE**

**Plumbing Contractor**

**NONE**

**See Bid forms for Information**

**END OF SECTION 012200**



## SECTION 012500 – SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements: Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.
  - 1. Section 012300 "Alternates" for products selected under an alternate.
  - 2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

#### 1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

#### 1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use CSI Form 13.1A
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication, or installation cannot be provided, if applicable.
    - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

- c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
  - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
  - e. Samples, where applicable or requested.
  - f. Certificates and qualification data, where applicable or requested.
  - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
  - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
  - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES
  - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
  - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 10 days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

## 1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

## 1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

## PART 2 - PRODUCTS

### 2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than **15** days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - b. Substitution request is fully documented and properly submitted.
    - c. Requested substitution will not adversely affect Contractor's construction schedule.
    - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - e. Requested substitution is compatible with other portions of the Work.
    - f. Requested substitution has been coordinated with other portions of the Work.
    - g. Requested substitution provides specified warranty.
    - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed unless otherwise indicated.
- C. Substitutions for Convenience: Architect will consider requests for substitution if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    - b. Requested substitution does not require extensive revisions to the Contract Documents.
    - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - d. Substitution request is fully documented and properly submitted.
    - e. Requested substitution will not adversely affect Contractor's construction schedule.
    - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - g. Requested substitution is compatible with other portions of the Work.
    - h. Requested substitution has been coordinated with other portions of the Work.

- i. Requested substitution provides specified warranty.
- j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

## SECTION 012600 – CONTRACT MODIFICATION PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing contract modifications.
  - 1. Provisions of this Section apply to the work of each prime contractor.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 1 Section "Submittals" for requirements for the Contractor's Construction Schedule.
  - 2. Division 1 Section "Applications for Payment" for administrative procedures governing Applications for Payment.
  - 3. Division 1 Section "Substitutions" for administrative procedures for handling requests for substitutions made after award of the Contract.

#### 1.3 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 Contract Time, on AIA Form G710, Architect's Supplemental Instructions.

#### 1.4 CHANGE ORDER PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: The Architect will issue a detailed description of proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Proposal requests issued by the Architect are for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.
  - 2. Within 10 days of receipt of a proposal request, submit an estimate of cost necessary to execute the change to the Architect for the Owner's review.
    - a. Include an itemized list of quantities of products required and unit costs, with the total amount of purchases to be made. Furnish survey data and backup invoices, quotes paperwork to substantiate.
    - b. Separate labor hours by trade and indicate labor rate. (Submit attached labor rate worksheet notarized for each trade / classification.)
    - c. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - d. Include an updated Contractors 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 float before requesting an extension of contract time.

- B. Contractor-Initiated Proposals: When latent or unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.
1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
  2. Include an itemized list of quantities of products required and unit costs, with the total amount of purchases to be made. Furnish survey data to substantiate quantities. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  3. Separate labor hours by trade and indicate labor rate. (Submit attached labor rate worksheet notarized for each trade / classification.)
  4. Comply with requirements in Section "Product Substitutions" if the proposed change requires substitution of one product or system for a product or system specified.
  5.
    - a. Include an updated Contractors 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 float before requesting an extension of contract time.
- C. Proposal Request Form: Use AIA Document G709 for Change Order Proposal Requests.

## 1.5 ALLOWANCES

- A. Allowance Adjustment: For allowance-cost adjustment, base each Change Order Proposal on the difference between the actual purchase amount and the allowance, multiplied by the final measurement of work-in-place. Where applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
1. Include installation costs in the purchase amount only where indicated as part of the allowance.
  2. When requested, prepare explanations and documentation to substantiate the margins claimed.
  3. Submit substantiation of a change in scope of work claimed in the Change Orders related to unit-cost allowances.
  4. The Owner reserves the right to establish the actual quantity of work-in-place by independent quantity survey, measure, or count.
  5. Contractor's overhead and profit, including costs for bonds & insurances, for these allowances shall be included in the values of the general requirements of contract sum and are not chargeable under allowance disbursement.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or the Contractor's handling, labor, installation, overhead, and profit. Submit claims within 15 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. The Owner will reject claims submitted later than 15 days.
1. Do not include the Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in Contract Documents.
  2. No change to the Contractor's indirect expense is permitted for selection of higher or lower-priced materials or systems of the same scope and nature as originally indicated.

## 1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: When the Owner and the Contractor disagree on the terms of a Proposal Request, the Architect may issue a Construction Change Directive on AIA Form G714/CMa. The Construction Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  - 1. The Construction Change Directive contains a complete description of the change in the Work. It also designates the method to be followed to determine change in the Contract Sum or Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  - 1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

## 1.7 CHANGE ORDER PROCEDURES

- A. Upon the Owner's approval of a Proposal Request, the Architect or Construction Manager will issue a Change Order for signatures of the Owner, Architect, Construction Manager and the Contractor on AIA Form G701.
- B. Contractor cannot requisition for any allowance or change order work until the paperwork has been fully executed by the Contractor, CM, Architect and Owner.
- C. Requests for changes in bond fees, if any, will be analyzed at the conclusion of the project. Contractors bonding company to submit substantiation. (Bond amount based on total adjusted contract value)

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 012600



**Arris Contracting Company, Inc.**  
**189 Smith Street**  
**Poughkeepsie, NY 12601**

**LABOR RATE WORKSHEET**

Project No. \_\_\_\_\_

Contractor Name: _____	County: _____	Date: _____
Address: _____		
Telephone Number: _____		

Trade: _____ (Provide separate sheet for each trade, foreman/journeyman, etc.)	REGULAR BASE RATE	PREMIUM TIME BASE RATE
---	----------------------	---------------------------

A. WAGE RATE PER HOUR			
BENEFITS (* Identifies benefits paid directly to the Employee.)	*	% per hour	\$ per hour
Vacation and Holiday			
Health and Welfare			
Pension			
Annuity			
Education / Apprentices Training			
Supplemental Unemployment			
Security Fund			
Industry Advancement			
UBC-Appr., Health, Safety, Educ.			
Labor Management Fund			

<b>B. TOTAL BENEFITS PER HOUR</b>		
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PAYROLL TAXES AND INSURANCE	
F.I.C.A. / Social Security (up to the maximum required by law)	%
Medicare	%
Federal Unemployment (up to a maximum of \$56.00 per employee per year)	%
State Unemployment (up to 1st \$8,500 of base salary paid per employee per year)	%
Workers' Compensation Code: _____	%
Disability	%

<b>C. TOTAL TAXES AND INSURANCE PER HOUR</b>		
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All Benefits are paid directly to Employee. \_\_\_\_\_ x \_\_\_\_\_ % =

Only benefits identified by \* are paid directly to Employee.

<b>D. TOTAL LABOR RATE</b>		( A + B + C ) =
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**E. DOCUMENTATION**  
 For General Liability and Workers Compensation, provide policy renewal page from insurance carrier (with contractor name, address, and insurance agent) for substantiation purposes.

<b>F. CONTRACTOR'S CERTIFICATION</b>	
I certify that the labor rates, insurance enumerations, labor fringe enumerations and expenses are correct and in accordance with actual and true cost incurred.	
_____ Signature	Sworn before me this _____ day
_____	of _____, 20 _____.
_____	_____
Print Name of Authorized Representative	Notary Public
_____	
Print Title	

## SECTION 01 29 00 – PAYMENT PROCEDURES

### PART I - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements governing each prime contractor's Applications for Payment.
  - 1. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, Submittal Schedule, and List of Subcontracts.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
  - 1. Schedules: The Contractor's Construction Schedule and Submittal Schedule are specified in Division 1 Section "Submittals."

#### 1.3 SCHEDULE OF VALUES

- A. Coordination: Contractor shall coordinate preparation of its Schedule of Values for the Work with preparation of the Contractors' Construction Schedule.
  - 1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
    - a. Contractor's Construction Schedule.
    - b. Application for Payment forms, including Continuation Sheets.
    - c. List of subcontractors.
    - d. Schedule of allowances.
    - e. Schedule of alternates.
    - f. Schedule of submittals.
  - 2. Submit the Schedule of Values to the Construction Manager within 10 days of receipt of Letter of Intent but no later than 10 days before the date scheduled for submittal of the initial Applications for Payment. (SOV's received after the 15<sup>th</sup> of the month, will not be allowed to requisition until the following month, due to input time for CM & owner into their computer systems.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish the format for the Schedule of Values. Provide at least one line item for each Specification Section.
  - 1. Identification: Include the following Project identification on the Schedule of Values:
    - a. Project name and location. (Each school and additions / renovations, will require separate breakdown sections, front end, etc. with subtotals)
    - b. Name of the Architect.
    - c. Project number.
    - d. Contractor's name and address.
    - e. Date of submittal.
  - 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
    - a. Related Specification Section or Division.
    - b. Description of Work.

- c. Name of subcontractor.
  - d. Name of manufacturer or fabricator.
  - e. Name of supplier.
  - f. Change Orders (numbers) that affect value.
  - g. Dollar value.
    - 1) Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Break principal subcontract amounts down into several line items where requested by Construction Manager. Multiple line items will be provided for amounts in excess of five percent of the contract sum, broken out into sub components equaling not greater than five percent each. Separate all line items by material & labor.
    - a. Breakdown shall be separated between additions and renovations with subtotals for each.
  4. In addition to the breakdown of specification sections, separate line items will be required for the following front-end line items:
    - a. Bonds & OCP insurances to have separate line items. (substantiation letters required from bonding & insurance company for any amounts higher than industry standard). Only OCP insurance allowed for insurance line item. All other insurance costs must be distributed by contractor throughout the various sections.
    - b. Supervision – include a minimum of one percent of contract sum.
    - c. Project Administration – include a minimum of one percent of contract sum
    - d. Project meetings (appropriate value for weekly attendance for entire duration of project – see Section 01 31 19 Project Meetings for amount)
    - e. Punchlist – include a minimum of .5 percent of contract sum
    - f. Closeout: separate lines for demobilization, Operation & maintenance manuals, Closeout paperwork, Demonstration & training (total for closeout minimum two percent of contract value)
    - g. Continuous Clean-up and Final Clean-up values each at minimum of .5 %
    - h. General Contractor to add line item for Broom sweep/ damp mopping
  5. Round amounts to nearest whole dollar; the total shall equal the Contract Sum.
  6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed.
    - a. Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing.
  7. Provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
  8. Unit-Cost Allowances: Show the line-item value of unit-cost allowances, as a product of the unit cost, multiplied by the measured quantity. Estimate quantities from the best indication in the Contract Documents.
  9. Margins of Cost: Show line items for indirect costs and margins on actual costs only when such items are listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete. Include the total cost and proportionate share of general overhead and profit margin for each item.
    - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at the Contractor's option.

10. Schedule Updating: Update and resubmit the Schedule of Values prior to the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

#### 1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the 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: Each progress-payment date is indicated in the Agreement. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment-Application Times: The date for each progress payment is the 21st day of each month (or as designated by the Owner). The period covered by each Application for Payment is the previous month.
- D. Payment-Application Forms: Use AIA Document G732/CMA (include line for Construction Manager signature) and Continuation Sheets G703 as the form for Applications for Payment.
  1. Separate Continuation Sheets shall be provided for work which takes place on each building, which will detail that portion of the contract which is attributable to the specific building. The appropriate S.E.D. project number(s) shall be shown on the top of each continuation form.
- E. Application Preparation: Complete every entry on the form. Include notarization and execution by a person authorized to sign legal documents on behalf of the Contractor. The Construction Manager will return incomplete applications without action.
  1. Entries shall match data on the Schedule of Values and the Contractor's Construction Schedule. Use updated schedules if revisions were made.
  2. Include amounts of Change Orders and Allowances issued prior to the last day of the construction period covered by the application. (No Change order or Allowance requisitions can be made or listed on the requisition, unless the formal CO/AD paperwork has been fully executed by Contractor, Construction Manager, Architect and owner)
  3. Provide copies of payrolls which are signed and notarized documenting compliance with prevailing wage laws. Payroll for contractors is required from the 25<sup>th</sup> of the previous month to the 24<sup>th</sup> of the current month. Payroll for subcontractors is required from the 15<sup>th</sup> of the previous month to the 14<sup>th</sup> of the current month.
  4. Provide copies of lien waivers for the previous payment. (or anticipated payment) Include certificate of monthly payment for subcontractors for the previous month.
  5. Provide OSHA 10 certificates for all workers on site.
  6. Payment for stored materials (whether onsite but not installed, or offsite in a secured warehouse) will require a bill of lading showing the exact value and photographs. In no case shall more than 90% be approved for uninstalled stored materials. An Insurance certificate must be provided, specific to the materials stored with the appropriate dollar value. (for onsite or offsite materials).
- F. Transmittal: Submit 5 signed and notarized original copies of each Application for Payment to the Construction Manager by a method ensuring receipt within 24 hours. Each copy shall be complete, and securely attached to include all waivers of lien, certified payrolls 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 and Construction Manager.
- G. Waivers of Mechanics Lien: With each Application for Payment, submit waivers of mechanics liens 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, submit final or full waivers.
  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.
- H. Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal of the first 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. When preliminary submissions are received with the initial application (items 4 and 7), the final submission for these items must be received and approved by the Construction Manager prior to submission of the second application for payment.
1. List of subcontractors.
  2. List of principal suppliers and fabricators.
  3. Schedule of Values.
  4. Contractor's Construction Schedule (preliminary if not final).
  5. Schedule of principal products.
  6. Schedule of unit prices.
  7. Submittal Schedule (preliminary if not final).
  8. List of Contractor's staff assignments.
  9. List of Contractor's principal consultants.
  10. Copies of building permits.
  11. Copies of authorizations and licenses from governing authorities for performance of the Work.
  12. Initial progress report.
  13. Report of preconstruction meeting.
  14. Certificates of insurance and insurance policies.
  15. Performance and payment bonds.
  16. Data needed to acquire the Owner's insurance.
  17. Initial settlement survey and damage report, if required.
- I. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment.
1. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
  2. Administrative actions and submittals that shall precede or coincide with this application include:
    - a. Occupancy permits and similar approvals.
    - b. Warranties (guarantees) and maintenance agreements.
    - c. Test/adjust/balance records.
    - d. Maintenance instructions.

- e. Meter readings.
  - f. Startup performance reports.
  - g. Changeover information related to Owner's occupancy, use, operation, and maintenance.
  - h. Final cleaning.
  - i. Application for reduction of retainage and consent of surety.
  - j. Advice on shifting insurance coverages.
  - k. Final progress photographs.
  - l. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.
- J. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following:
- 1. Completion of Project closeout requirements.
  - 2. Completion of items specified for completion after Substantial Completion.
  - 3. Ensure that unsettled claims will be settled.
  - 4. Ensure that incomplete Work is not accepted and will be completed without undue delay.
  - 5. Transmittal of required Project construction records to the Owner.
  - 6. Certified property survey.
  - 7. Proof that taxes, fees, and similar obligations were paid.
  - 8. Removal of temporary facilities and services.
  - 9. Removal of surplus materials, rubbish, and similar elements.
  - 10. Change of door locks to Owner's access.

## PART 2 - PART 1 - PRODUCTS (Not Applicable)

## PART 3 - EXECUTION

- 3.1 No retainage release will be approved by owner until all closeout documents (Closeout paperwork, as-builts, O & M manuals, AIA release forms, warranties, material turnover receipts, etc.) are received and verified complete.

END OF SECTION 012900



## SECTION 013100 – PROJECT MANAGEMENT AND COORDINATION

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. Coordination Drawings.
  - 2. Administrative and supervisory personnel.
  - 3. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections include the following:
  - 1. Division 1 Section "Submittal Procedures" for Administrative and Procedural Requirements for submitting Shop Drawings.
  - 2. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

#### 1.03 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
- B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.

4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
  2. Preparation of the Schedule of Values.
  3. Installation and removal of temporary facilities and controls.
  4. Delivery and processing of submittals.
  5. Progress meetings.
  6. Preinstallation conferences.
  7. Startup and adjustment of systems.
  8. Project closeout activities.
- E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

#### 1.04 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
    - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - b. Indicate required installation sequences.
    - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and

minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
  3. Number of Copies: Submit five (5) copies where Coordination Drawings are required for operation and maintenance manuals. Architect will retain two copies; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.
  4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
- B. Key Personnel Names: Within fourteen (14) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

#### 1.05 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
1. Include special personnel required for coordination of operations with other contractors.

#### 1.06 PROJECT MEETINGS

- A. General: Construction Manager shall schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Construction Manager shall inform participants and others involved, and individuals whose presence is required, of date and time of each meeting.
  2. Agenda: Construction Manager shall prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Construction Manager shall record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned of including Owner and Architect, within three (3) days of the meeting.
- B. Preconstruction Conference: Construction Manager shall schedule a preconstruction conference before starting construction, at a time convenient to Prime Contractors, Owner, Construction Manager and Architect, but no later than seven (7) days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Designation of key personnel and their duties.
    - e. Procedures for processing field decisions and Change Orders.
    - f. Procedures for requests for interpretations (RFIs).
    - g. Procedures for testing and inspecting.
    - h. Procedures for processing Applications for Payment.
    - i. Distribution of the Contract Documents.
    - j. Submittal procedures.
    - k. Use of the premises.
    - l. Work restrictions.
    - m. Owner's occupancy requirements.
    - n. Responsibility for temporary facilities and controls.
    - o. Construction waste management and recycling.
    - p. Parking availability.
    - q. Office, work, and storage areas.
    - r. Equipment deliveries and priorities.
    - s. First aid.
    - t. Security.
    - u. Progress cleaning.
    - v. Working hours.
  3. Minutes: Construction Manager will record and distribute meeting minutes.
- C. Preinstallation Conferences: Construction Manager shall conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting.
  2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. The Contract Documents.
    - b. Options.
    - c. Related requests for interpretations (RFIs).
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.

- j. Compatibility problems.
  - k. Time schedules.
  - l. Manufacturer's written recommendations.
  - m. Warranty requirements.
  - n. Temporary facilities and controls.
  - o. Space and access limitations.
  - p. Regulations of authorities having jurisdiction.
  - q. Testing and inspecting requirements.
  - r. Installation procedures.
  - s. Coordination with other work.
  - t. Required performance results.
  - u. Protection of adjacent work.
  - v. Protection of construction and personnel.
3. Construction Manager shall record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  4. Reporting: Construction Manager shall distribute minutes of the meeting to each party present and to parties who should have been present.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Construction Manager shall conduct progress meetings at biweekly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Construction Manager, and Architect, each contractor, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.

- 6) Access.
  - 7) Site utilization.
  - 8) Temporary facilities and controls.
  - 9) Work hours.
  - 10) Hazards and risks.
  - 11) Progress cleaning.
  - 12) Quality and work standards.
  - 13) Status of correction of deficient items.
  - 14) Field observations.
  - 15) Requests for interpretations (RFIs).
  - 16) Status of proposal requests.
  - 17) Pending changes.
  - 18) Status of Change Orders.
  - 19) Pending claims and disputes.
  - 20) Documentation of information for payment requests.
3. Minutes: Construction Manager will record and distribute to Contractor the meeting minutes.
  4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
    - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

## SECTION 013150 – COVID-19 CONTRACTOR COMPLIANCE

The contents of this Section are **NOT** authored by the Owner, Architect of Record, Engineers of Record, nor the Construction Manager, but are provided as guidelines published by others, including but not limited to, the CDC, ESD (Empire State Development), DOH, OSHA, etc.

1.1 In response to the public health emergency for the COVID-19, Governor Andrew Cuomo has declared a State disaster emergency and temporarily suspended or modified laws that would prevent, hinder, or delay action necessary to cope with the disaster or emergency. The Governor has also issued directives to allow for the expansion of certain services including those relating to emergency procurement, and to facilitate the continued work of essential businesses. Under Executive Order 202.6, as amended September 2020, a construction project is permitted to continue if it is essential. Please refer to Empire State Development (ESD) guidance to determine if your project is essential <https://esd.ny.gov/guidance-executive-order-2026>. The purpose of this guidance is to set forth the recommended practices for all Contractors performing work at construction sites in the context of the COVID-19 health crisis.

### A. Contractor Responsibilities:

Under standard contracting agency/authority agreements,

1. Contractors and their subcontractors are always required to guard the safety and health of all persons on and in the vicinity of the work site
2. Contractors and their subcontractors are required to comply with all applicable rules, regulations, codes, and bulletins of the New York State Department of Labor and the standards imposed under the Federal Occupational Safety and Health Act of 1970, as amended (“OSHA”)
3. Contractors and their subcontractors are also required to comply with all Client safety requirements
4. Contractors and their subcontractors must comply with all City or State of New York safety requirements for projects within the City or State of New York constructed in accordance with the applicable building code, and contractors are required to provide written safety plans for the site showing how all safety requirements of applicable law will be implemented for the duration of the contract
5. Contractors will comply with these requirements as part of their contract, as well as any updates / revisions which are subsequently issued by the governing agencies.

1.2 Contractors and their subcontractors must also adhere to the following practices to help prevent exposure and spread of COVID-19. The following recommendations are based on what is currently known about COVID-19. Contractors and their subcontractors are advised to stay current and immediately implement the most up-to-date practices to protect the safety and health of your employees, clients, and the general public.

### A. Contractor Submittals

1. All contractors are required to submit a copy of their own company policy which confirms their compliance with these requirements and demonstrates your workers will properly comply.
2. Designate a specific "Responsible party" who will be the individual on-site in charge of COVID compliance
3. Include in your submission the name of the designated individual who will be onsite.

B. General Responsibilities:

1. Contractors and their subcontractors should educate their employees on the symptoms of COVID-19, which include cough, fever, trouble breathing, and pneumonia. Contractors and their subcontractors must instruct any employee who feels they may meet the above criteria to refrain from reporting to the jobsite and immediately contact their local health department in the county in which they reside.
2. If the employee begins to exhibit these symptoms while in the workplace, steps should be taken to isolate the individual, place a surgical mask on the individual and inform your local health department and the contracting agency/authority.
3. Personnel should be advised to self-quarantine in accordance with the requirements of the New York State and local health department. Contracting agencies/authorities reserve the right to require any employee of the Contractor, and their subcontractors exhibiting symptoms, to be removed from the jobsite.
4. If an employee is confirmed to have COVID-19 infection, contractors and their subcontractors should inform fellow employees, who have been in contact with this employee, of their possible exposure to COVID-19 in the workplace while maintaining confidentiality as required by applicable New York State and federal law. The fellow employees should then self-monitor for symptoms (i.e., cough, fever, trouble breathing, and pneumonia) and self-quarantine in accordance with the requirements of the New York State and local health department.
5. If an employee tests positive for COVID-19, Contractors and their subcontractors should direct the employee to self-quarantine or remain quarantined for 14 days, following the guidance of New York State and local health department.
6. Contractors and their subcontractors may permit such employee to return to the jobsite when this employee produces a negative COVID-19 test or receives medical clearance to return to work.
7. If an employee tests negative for COVID-19, contractors and their subcontractors may direct the employee to return to work after recovery from their illness. Any direct contacts on pre-cautionary quarantine may return to the jobsite and resume their work activities.

C. Social Distancing:

1. Do not host large group meetings or congregate in large groups. When meetings are necessary, maintain a distance of 6 feet between people

2. Perform any toolbox or other training maintaining the distance of 6 feet between people
3. Perform meetings online or via conference call whenever possible
4. Only essential personnel should be permitted on the jobsite
5. Discourage handshaking and other contact greetings

D. General Jobsite Practices:

1. Procedures and supplies should be in place to encourage proper hand and respiratory hygiene. (**General Work Contractor is required to provide, install and maintain self-contained temporary hygiene/washing station(s) for use by all workers – provide minimum 1 washing station per 20 workers**)

a. Hand Hygiene:

Signage with handwashing procedures should be posted in prominent locations promoting hand hygiene:

1. Regular handwashing with soap and water for at least 20 seconds should be done:
  - Before and after eating.
  - After sneezing, coughing, or nose blowing
  - After using the restroom
  - Before handling food
  - After touching or cleaning surfaces that may be contaminated
  - After using shared equipment and supplies; and also
  - Whenever a contractor or subcontractor believes it is necessary
2. If soap and water are not available, use an alcohol-based hand sanitizer that contains at least 60% alcohol

b. Respiratory Hygiene:

1. **ALL SITE PERSONELL MUST WEAR FACE COVERING PROTECTION AT ALL TIMES TO COVER MOUTH AND NOSE (No Exceptions)**
  2. Covering coughs and sneezes with tissues or the corner of elbow
  3. Disposing of soiled tissues immediately after use
2. **At the end of each work shift each Contractor will perform routine environmental cleaning and disinfecting of all hard surfaces in the common and work areas.** This includes corridor surfaces, doorknobs, workstations, project trailers and offices, portable toilets, countertops, handles, gang boxes, tools and equipment. See OSHA Guidance on Preparing Workplaces for COVID-19. [www.osha.gov/Publications/OSHA3990.pdf](http://www.osha.gov/Publications/OSHA3990.pdf)
  3. Appropriate cleaning agents and directions should be utilized to perform all cleaning. Ensure all workers are trained on the hazards of cleaning chemicals used in the workplace and comply with all OSHA requirements regarding same in accordance with the Hazard Communication (Global Harmonization) Standard. Information about <https://coronavirus.health.ny.gov/home>
  4. Do not use a common water bottle
  5. If using a common water cooler clean dispenser knob after use

6. Do not share tools
  7. Utilize personal protection equipment (PPE) for the job being performed
  8. Sanitize reusable PPE per manufacturer's recommendation prior to each use
  9. Do not share PPE
  10. Ensure used PPE and other trash is disposed of properly
  11. Utilize disposable gloves where appropriate and instruct workers to wash hands after removing gloves
  12. Disinfect reusable supplies and equipment
  13. Stagger work schedules to minimize the number of people on a job site at any one time
  14. Keep one contractor or subcontractor in an area at a time. Indicate an area is occupied with workers with a sign or flag indicating which contractor or subcontractor is in the area at that time. Remove the sign or flag after completion of work in that area to let others know they may then enter into that area to perform their work. The next contractor or subcontractor will then post their sign or flag to notify others that the area is occupied.
  15. Minimize the number of workers in an area as much as possible by using indicators of an occupied area (signs or flags) scheduling work activities to stagger those required to be in any one time to a minimal number of workers.
  16. Minimize entryways into a work area so that employees will be able to observe flagging practices described above. Do not reduce number of emergency exits.
  17. Avoid cleaning techniques, such as pressurized air or water sprays that may result in generation of bioaerosols
- 1.3 Contracting agencies/authorities may request an updated written safety plan for the site to address practices to help prevent exposure and spread of COVID-19 at the jobsite pursuant to New York State, OSHA recommendations and Centers for Disease Control requirements, which include:
1. Assessment of potential worker exposure hazards, taking into account the specific recommendations and controls for the four levels of worker exposure risk identified in OSHA's Guidance on Preparing Workplaces for COVID-19 (i.e. very high, high, med, Low)
  2. Selecting, implementing, and ensuring the use of control (i.e., social distancing appropriate personal protective equipment, hygiene, and cleaning supplies);
  3. Minimizing the number of workers in an area as much as possible by using indicators of an occupied area (signs or flags) and scheduling work activities to stagger those required to be in any one area to a minimal number of workers.
  4. Minimize entryways into a work area so that employees will be able to observe flagging practices described above. Do not reduce number of emergency exists; and

5. Additional criteria consistent with health and safety practices at the work site

1.4 Project Closure:

1. Where work is suspended on a project, contractors are directed to follow any additional project shut-down protocols as provided by the contracting agency/authority
2. For NYS Business Reopening Safety Plan Template and Construction Master Guidance Plan please refer to below links:

[https://www.governor.ny.gov/sites/governor.ny.gov/files/atoms/files/NYS\\_BusinessReopening\\_SafetyPlanTemplate.pdf](https://www.governor.ny.gov/sites/governor.ny.gov/files/atoms/files/NYS_BusinessReopening_SafetyPlanTemplate.pdf)

<https://www.governor.ny.gov/sites/governor.ny.gov/files/atoms/files/ConstructionMasterGuidance.pdf>

E. For additional resources:

OSHA COVID-19 Resources

OSHA Guidance on Preparing Workplaces for COVID-19

DOL COVID-19 Resources

Interim Guidance for Business and Employers

Centers for Disease Control - - <https://www.cdc.gov/coronavirus/2019-ncov/index.html>

*The Bidder agrees it is responsible for complying with any and all health and safety requirements issued by federal, state or local entities, including but not limited to New York State Governor Office Executive Orders, New York State Department of Health rules, regulations and guidance, and other New York State, Fund or Campus laws, rules, regulations or requirements that exist or may be issued and/or amended during the bidding and/or performance of work on this Project.*

*With respect to the COVID-19 pandemic, Bidder specifically acknowledges and agrees that the NYS DOH Interim COVID-19 Guidance for Construction Projects, "Guidance", in effect at the time of bid is made a part of the contract work for this Project, as set forth in General Requirements. Bidder affirms that all costs and time associated with compliance with the current Guidance are included in its bid. The current Guidance is available at the following website:*

<https://forward.ny.gov/industries-reopening-phase#phase-one-construction>

*Notwithstanding the foregoing, Bidder agrees to comply with the Guidance as it may be amended or superseded in the future.*

END OF SECTION 013150



## SECTION 013216 – CONSTRUCTION PROGRESS SCHEDULE

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Each Prime Contractor shall develop a full schedule, in sufficient detail and clarity of form and technique so that the contractor can plan and control his work properly and the Construction Manager/Owner can readily monitor and follow the progress for all portions of the work. The Contractor shall complete the detailed schedule within 10 days after contract award.
- B. The schedule shall comply with the various limits imposed by the scope of work any by any contractually intermediate milestone dates and completion dates included in the contract.
- C. The activities identified in the schedule shall be analyzed in detail to determine activity time durations in units of whole working days. All durations shall be the result of definitive manpower and resource planning by the Contractor. The contractor will provide specific manpower loading information / crew size to support the duration proposed. (e.g. – 4-man crew can get 1000 sf / day project has 11000 sf; thus, duration was identified as 11 days)
- D. The activity data shall include activity codes to facilitate selection, sorting and preparation of summary reports and graphics. Activity codes shall be developed for:
  - 1. Area: Subdivision of the site into logical modules or blocks and levels.
  - 2. Responsibility: contractor or subcontractor responsible for the work.
  - 3. Specifications: 33 Division CSI format.
  - 4. System: Division of the work into building systems for summary purposes.
  - 5. Milestone: Work associated with completion of interim completion dates or milestones.
  - 6. Pay Item: Work identified with a pay item on the Schedule of Values.

#### 1.2 REPORTS

- A. For initial submittal and each update, the contractor shall prepare the following standard report:
  - 1. Tabular Schedule Report sorted by Activity code and Early Start.

#### 1.3 GRAPHICS

- A. For initial submittal the contractor shall prepare the following graphics:
  - 1. Pure logic diagram (Precedence Format) of entire data, not time scaled, grouped by Activity code.
  - 2. Detailed bar chart sorted by Activity Code with Early Start and Early Finish.
  - 3. Summary bar chart summarizing by Activity Code with Early Start and Early Finish.
- B. For each update the contractor shall prepare the following graphic:
  - 1. Bar Chart showing work activities with Early Start in the next 40 work days sorted by Activity Code and Early Start.
  - 2. Summary Bar Chart summarizing by Activity Code showing progress with Early Start and Early Finish.

- C. For each Change Order involving adjustment in the contract time for performance the contractor shall prepare a pure logic diagram showing the changed work with all predecessor and successor activities (Fragnet).

#### 1.4 SUBMITTALS

- A. In no case shall first application for payment be approved prior to submission of acceptable preliminary schedule, detailed submittal schedule, and schedule of values.
- B. Monthly updates, required schedules and graphics shall be submitted to the Construction Manager/Owner within five working days following the end of the preceding month. Monthly updates, schedules and graphics shall be submitted in five copies.
- C. If any of the required submissions are returned to the Contractor for corrections or revisions, they shall be resubmitted within ten (10) calendar days after the return mailing date. Resubmittals shall be in the same quantities as noted above. Review and response by the Construction Manager/Owner will be given within (10) calendar days after resubmission.

#### 1.5 PAYMENT WITHHELD

- A. If the Contractor fails to submit the required schedule information as indicated in this section within the time prescribed or revision thereof within the requested time, the Construction Manager/Owner may withhold approval of Progress Payment Estimates until such time as the Contractor submits the required information.

#### 1.6 UPDATES

- A. Updates of the Schedule shall be made every two weeks reflecting actual or reasonably anticipated progress as of the last working day of the month. Monthly updates of the Detailed Schedule will be made each month until all work is substantially complete.
- B. The Contractor will meet with the Construction Manager/Owner at the end of the updated period to review information in draft form before preparation of the required schedules and graphics. The Contractor will present data, prepared in advance, for review and approval of the Construction Manager/Owner including:
  - 1. Actual Start Dates.
  - 2. Actual Completion Dates.
  - 3. Activity percent complete and/or Remaining Duration.
  - 4. Revised logic, changes in activity duration's or resource assignments.
  - 5. Narrative report discussing progress through the update period; changes, delays or other circumstances affecting progress; status of the project with respect to completion schedule; and any efforts by the Contractor to improve progress.
- C. The update meeting will establish the values to be submitted for payment and will be directly related to the schedule of values in the application for payment.
- D. The Contractor shall prepare a report of the meeting and make all changes, additions or corrections to the data resulting from the review. The contractor shall promptly prepare the monthly submittal following the update meeting.

## 1.7 CHANGES, DELAYS AND EXTENSIONS OF TIME

- A. When changes or delays are experienced, the Contractor shall submit to the Construction Manager/Owner a Time Impact Analysis illustrating the influence of each change or delay on the current Contract scheduled completion date. Each time analysis shall include a Fragnet (network analysis) demonstrating how the Contractor proposed to incorporate the change or delay into the Detailed Schedule. Additionally, the analysis shall demonstrate the time impact based on the date the change was given to the Contractor, the status of construction at that point in time, and the activity duration of all effected activities. The activity duration used in this analysis shall be those included in the latest update of the Detailed Schedule, closest to the time of delay or as adjusted by mutual agreement.
- B. Each Time Impact Analysis shall be submitted within ten (10) calendar days after a delay occurs or a notice of change order is given to the Contractor. In cases where the Contractor does not submit a Time Impact Analysis for a specific change or delay with a specified period of time, it shall be mutually agreed that no time extension is required. Final evaluation of each Time Impact Analysis by the Construction Manager/Owner shall be made within fourteen (14) calendar days after receipt unless subsequent meetings and negotiations are necessary. Adjustments in the Contract time for performance shall be made only by written change order approved by the Owner. Upon approval of the Owner, Fragnets illustrating the influence of changes and delays shall be incorporated into the Detailed Schedule by the contractor during the first update after agreement is reached.
- C. The time difference between the Early Finish date and the Late Finish Date is defined as "float." The "float" belongs to the Project and may be used by the Construction Manager/Owner to benefit the Project. Changes or delays that influence activities in the network with "float" and do not extend the Critical Path (the network of activities with zero days "float") shall not be justification for an adjustment in Contract time for performance.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 013216



## SECTION 013233 – PHOTOGRAPHIC DOCUMENTATION

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
  - 1. Preconstruction photographs.
  - 2. Periodic construction photographs.
- B. Related Sections include the following:
  - 1. Division 1 Section "Closeout Procedures" for submitting digital media as Project Record Documents at Project closeout.

#### 1.03 SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same label information as corresponding set of photographs.
- B. Construction Photographs: Submit two prints of each photographic view within seven days of taking photographs.
  - 1. Format: 4-by-6-inch smooth-surface matte prints on single-weight commercial-grade photographic paper, enclosed back to back in clear plastic sleeves that are punched for standard 3-ring binder.
  - 2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:
    - a. Date photograph was taken if not date stamped by camera.
    - b. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
    - c. Unique sequential identifier.
  - 3. Digital Images: Submit a complete set of digital image electronic files with each submittal of prints as a Project Record Document on CD-ROM. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped.

#### 1.04 COORDINATION

- A. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities, including temporary lighting required to produce clear, well-lit photographs without obscuring shadows.

## 1.05 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

## PART 2 - PRODUCTS

### 2.01 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1024 by 768 pixels.

## PART 3 - EXECUTION

### 3.01 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
  - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
  - 1. Date and Time: Include date and time in filename for each image.
  - 2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Architect.
- C. Preconstruction Photographs: Before commencement of demolition, take color, digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
  - 1. Take eight photographs to show existing conditions adjacent to property before starting the Work.
  - 2. Take twenty photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
  - 3. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

- D. Periodic Construction Photographs: Take 12 color, digital photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- E. Architect-Directed Construction Photographs: From time to time, Architect will instruct photographer about number and frequency of color, digital photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.
- F. Final Completion Construction Photographs: Take eight color photographs after date of Substantial Completion for submission as Project Record Documents. Architect will direct photographer for desired vantage points.
  - 1. Do not include date stamp.

END OF SECTION 013233



## SECTION 013300 – SUBMITTALS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:
  - 1. Contractor's construction schedule.
  - 2. Submittal schedule.
  - 3. Daily construction reports.
  - 4. Shop Drawings.
  - 5. Product Data.
  - 6. Samples.
  - 7. Quality assurance submittals.
- B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:
  - 1. Permits.
  - 2. Applications for Payment.
  - 3. Performance and payment bonds.
  - 4. Insurance certificates.
  - 5. List of subcontractors.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 1 Section " Payment Procedures" specifies requirements for submittal of the Schedule of Values.
  - 2. Division 1 Section " Project Management and Coordination" specifies requirements governing preparation and submittal of required Coordination Drawings.
  - 3. Division 1 Section "Project Meetings" specifies requirements for submittal and distribution of meeting and conference minutes.
  - 4. Division 1 Section "Quality Requirements" specifies requirements for submittal of inspection and test reports.
  - 5. Division 1 Section "Execution and Closeout Requirements " specifies requirements for submittal of Project Record Documents and warranties at project closeout.

#### 1.3 DEFINITIONS

- A. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended.
  - 1. Preparation of Coordination Drawings is specified in Division 1 Section "Project Management and Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.

- B. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.
- C. Mockups are full-size assemblies for review of construction, coordination, testing, or operation; they are not Samples.

#### 1.4 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
    - 1. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
  - 3. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.
    - 1. Submittals must be transmitted in accordance with the requirements of Section 1.6.
    - 2. Allow between 10 and 15 business days for initial review of the first round of submittals. See 1.6 for more information. Allow additional time if the Architect must delay processing to permit coordination with subsequent submittals.
    - 3. If an intermediate submittal is necessary, process the same as the initial submittal.
    - 4. Allow an additional 10 business days for reprocessing each resubmittal.
    - 5. No extension of Contract Time will be authorized because of contractor's failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.
    - 6. If the contractor delays on key submittals which can negatively impact the project schedule, the owner and his agent(s) can withhold payments as necessary until the proper submittal paperwork is received.
- B. Submittal Preparation:
  - 1. Each copy of each submittal will have a "submittal cover sheet" attached identifying all information requested by Architect. (see copy after this section) All SCS must be approved by contractor (see electronic stamp B.5) signed, dated and have all fields completely filled-out. Any submittal received without proper use of this Cover Sheet will be returned immediately to the contractor. Cover sheet for contractor's use is included at the end of this section.
  - 2. A Submittals Website, an internet (web-based) service shall be used by all contractors to provide an on-line database and repository which shall be used to transmit and track project related documents. The Submittals Website is provided by the Construction Manager. Upon Contract award the successful bidders will be given log on instructions. The intent for using the Submittals Website is to expedite the construction process by reducing paperwork, improving information flow, and decreasing submittal review turnaround time.

3. Project submittals (shop drawing, product data and quality assurance submittals) shall be transmitted by the Contractor in Portable Document Format (PDF) to the Submittals Website, where it will be tracked and stored for retrieval for review. After the submittal is reviewed it is uploaded back to the Submittals Website for action or use by the Contractor and Owners Representatives.
4. The service also tracks and stores documents related to the project such as RFI's (Request for Information), Contacts, Meeting Minutes, Punchlist, and Non-Compliance Notices.
5. For each submittal, the Contractor shall review and apply electronic stamp certifying that the submittal complies with the requirements of the Contract Documents, including verification of manufacturer/product, dimensions and coordination of information with other parts of the work. (contractor sign and date)
6. It is the Contractor's responsibility to provide the submittals in a PDF format. The contractor may use any of the following options:
  - a. Subcontractors and suppliers provide paper submittals to the Contractor, who electronically scans and converts them to PDF format.
  - b. Contract a Scanning Service, which will allow the Contractor and the Contractor's subcontractors and suppliers to provide paper submittals to the Scanning Service, which electronically scans and converts them to PDF format. It will be the Contractor's responsibility to transmit the scanned submittals to the Submittals Website.
7. Image Quality:
  - a. Image resolution: The PDF files shall be created at a minimum resolution of 200 dots per inch utilizing the original document size. The Contractor will be responsible to increase the resolution of the scanned file or images being submitted as required to adequately presenting the information.
  - b. Image Color Rendition: When information represented requires color to convey the intent and compliance, provide full color PDF reproduction.

C. Contractor Internet Service and Equipment Requirements:

1. The Contractor will be required to have an Email address and Internet access at Contractor's main office.
2. Unless the Contractor will exclusively be using a Scanning Service to create all PDF documents, the Contractor will be required to own a PDF reviewing, creating and editing software, such as Adobe Acrobat ([www.adobe.com](http://www.adobe.com)), Bluebeam PDF Revu ([www.bluebeam.com](http://www.bluebeam.com)), or other similar PDF reviewing, creating and editing software for applying electronic stamps and comments.
3. The Contractor will be required to have a web browser such as Internet Explorer 11, Firefox 30-51.
4. The Contractor will be required to have Java Run Time Environment: Minimum Java version 8 update 121.
5. The Contractor will be required to have Adobe Reader version 11: Sage uses a pdf creator to generate forms. In order to print / view forms you will need Adobe Reader.
6. Contractors are required to have network securities in place such as anti-virus that is active and up to date. Do not access Contract Management from unsecured or public network location such as free WI-FI hotspots.

D. Training and Support:

1. A training manual shall be available, free of charge from the Construction Manager, for all project participants regarding use of the Submittals Website and PDF submittals.
2. Training will be provided by the Construction Manager at Arris's main office located in Poughkeepsie NY. The appropriate personnel from each contractor office are required to attend this meeting.

- E. Paper Copies:
  - 1. Contractor Copies: The Contractor will be responsible for making copies, for the Contractor's own use and for use by its subcontractors and suppliers.
  
- F. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the CM electronically using a transmittal form. The CM will then transmit to the Architect. The Architect will not accept submittals received from sources other than the Construction Manager.
  - 1. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.
  - 2. Transmittal Form: Use AIA Document G810 and submit Sage notification to ACCI that the submittal has been uploaded. The contractor's transmittal must have the subject description properly filled out, so that all parties can see what section/product is being submitted without having to open the actual submittal.
  - 3. Transmittal Form: Use the sample form at the end of this Section for transmittal of submittals.

#### 1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Distribution: It is the contractor's responsibility to coordinate submittals with each subcontracting trade. Each contractor shall be required to provide their subcontractors with a complete list of their submittals in order that other contractors can request required submittal information.
  - 1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

#### 1.6 SUBMITTAL SCHEDULE

- A. Submittals must be prepared and transmitted as follows, unless otherwise approved by the Construction Manager:
  - 1. Within 15 working days after Notice to Proceed:
    - 1. Window Submission
    - 2. HVAC units
    - 3. Ductwork shop drawings
    - 4. Electrical fixtures and panels
    - 5. Metal Lockers
    - 6. Door & Hardware submission
    - 7. Asbestos Abatement submittals & Plan
    - 8. All other submittals critical to the schedule.
  - 2. Balance of Submittals – after 15 days but within 30 days after Notice to Proceed.
  - 3. If the contractor misses the milestone submittal timeframes listed above, the owner / agents can withhold requisition payments until the required paperwork is received. If there are any open submittals beyond 60 days of contract award, the owner will stop all contractor payments until all missing paperwork is received.
  - 4. Upon approval by the Construction Manager, non-critical submittals may be transmitted later.
  - 5. Prepare submittals including information in paragraph 1.4B above.

- B. Schedule Updating: Revise the submittal schedule after each meeting or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

#### 1.7 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report recording the following information concerning events at the site, and electronically submit one copy to the Architect and one copy to the Construction Manager by 10:00 am the following day. Any contractor not submitting required reports will not receive approval on the subsequent application for payment until such time that all required information is submitted:
  - 1. List of subcontractors at the site.
  - 2. Count of personnel at the site (substantiates payroll).
  - 3. High and low temperatures, general weather conditions.
  - 4. Accidents and unusual events.
  - 5. Meetings and significant decisions.
  - 6. Stoppages, delays, shortages, and losses.
  - 7. Meter readings and similar recordings.
  - 8. Emergency procedures.
  - 9. Orders and requests of governing authorities.
  - 10. Change Orders received, implemented.
  - 11. Services connected, disconnected.
  - 12. Equipment or system tests and startups.
  - 13. Partial Completions, occupancies.
  - 14. Substantial Completions authorized.

#### 1.8 SHOP DRAWINGS

- A. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.
- B. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:
  - 1. Dimensions.
  - 2. Identification of products and materials included by sheet and detail number.
  - 3. Compliance with specified standards.
  - 4. Notation of coordination requirements.
  - 5. Notation of dimensions established by field measurement.
  - 6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 36 by 48 inches.
  - 7. All Technical Submittals:
    - I. Electronic shop drawing submittal to Construction Manager.
  - 8. Do not use Shop Drawings without an appropriate final stamp indicating action taken.
  - 9. Maintain approved copies on site to record "as-built" conditions.
  - 10. Submit additional copies of as-built, approved drawings as specified in project closeout.

#### 1.9 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Submit prior to shop drawings or simultaneously when products are specified items or A/E approval is granted. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.
1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following that are not required, mark copies to indicate the applicable information. Include the following information:
    1. Manufacturer's printed recommendations.
    2. Compliance with trade association standards.
    3. Compliance with recognized testing agency standards.
    4. Application of testing agency labels and seals.
    5. Notation of dimensions verified by field measurement.
    6. Notation of coordination requirements.
  2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
  3. Submit digitally through the Submittals Website to CM.
  4. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
    1. Do not proceed with installation until a copy of Product Data is in the Installer's possession.
    2. Do not permit use of unmarked copies of Product Data in connection with construction.

#### 1.10 SAMPLES

- A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern. Sample are submitted directly to the architects home office and copy Construction Manager with transmittal.
1. Mount or display Samples in the manner to facilitate review of qualities indicated. Prepare Samples to match the Architect's sample. Include the following:
    1. Specification Section number and reference.
    2. Generic description of the Sample.
    3. Sample source.
    4. Product name or name of the manufacturer.
    5. Compliance with recognized standards.
  2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
    1. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least 3 multiple units that show approximate limits of the variations.

2. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
  3. Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.
  4. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.
3. Preliminary Submittals: Submit a full set of choices where Samples are required for selection of color, pattern, texture, or similar characteristics from a range of standard and premium choices.
1. The Architect will review and distribute selections made or other action.
4. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit 6 sets to the Architect who will distribute one set to CM and two (2) to the contractor marked with the action taken.
5. Maintain sets of Samples, as returned, at the Project Site, for quality comparisons throughout the course of construction.
1. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
  2. Sample sets may be used to obtain final acceptance of the construction associated with each set.
- B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.
1. Field samples are full-size examples erected on-site to illustrate finishes, coatings, or finish materials and to establish the Project standard.
  1. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

#### 1.11 QUALITY ASSURANCE SUBMITTALS

- A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.
- B. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.
  1. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.
- C. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 1 Section "Quality Control."

#### 1.12 ARCHITECT'S ACTION

- A. Except for submittals for the record or information, where action and return is required, the Architect will review each submittal, mark to indicate action taken, and return promptly.
  - 1. Compliance with specified characteristics is the Contractor's responsibility, as stated on the approval stamp.
  
- B. Action Stamp: The Architect will stamp each submittal with a uniform, action stamp. The Architect will mark the stamp appropriately to indicate the action taken, as follows:
  - 1. Unsolicited Submittals: The Architect will return unsolicited submittals to the sender without action.
  - 2. Final Unrestricted Release: When the Architect marks a submittal "Furnish as Corrected", the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
  - 3. Final-But-Restricted Release: When the Architect marks a submittal "Make Corrections Noted", the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance. (No resubmittal is required.)
  - 4. "Revise and Resubmit" When the Architect marks a submittal " Revise and Resubmit", do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay.
  - 5. Returned for Resubmittal: When the Architect marks a submittal "Rejected", do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary, to obtain different action mark.
    - I. Do not use, or allow others to use, submittals marked "Rejected" at the Project Site or elsewhere where Work is in progress.
  - 6. Other Action: Where a submittal is for information or record purposes only and does not require approval and the contractor is responsible for the conformance of the product, the Architect will return the submittal marked "Reviewed".
  - 7. "Submit specified item": When submittal is marked "Submit Specified Item", the Contractor shall immediately submit the specified item,

PART 2 - EXECUTION (Not Applicable)

END OF SECTION 013300

## SECTION 014000 – QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Contractor is responsible for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner/Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
  - 1. Division 1 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
  - 2. Technical Sections for specific test and inspection requirements.

#### 1.03 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.
- C. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

- D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- E. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- I. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five (5) previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

#### 1.04 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect in writing for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision in writing before proceeding.

#### 1.05 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Description of test and inspection.
  - 3. Identification of applicable standards.

4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

#### 1.06 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
  - 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
  
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
  - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
  - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
  
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
  
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
  - 1. Contractor responsibilities include the following:
    - a. Provide test specimens representative of proposed products and construction.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    - f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
  - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

## 1.07 QUALITY CONTROL

- A. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

- a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  2. Notify testing agencies at least twenty-four (24) hours in advance of time when Work that requires testing or inspecting will be performed.
  3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- B. **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."
- C. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. **Testing Agency Responsibilities:** Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform any duties of Contractor.
- E. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. Delivery of samples to testing agencies.
  6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  7. Security and protection for samples and for testing and inspecting equipment at Project site.

- F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within sixty (60) days of date established for the Notice to Proceed.
  - 1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.01 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
  - 1. Date test or inspection was conducted.
  - 2. Description of the Work tested or inspected.
  - 3. Date test or inspection results were transmitted to Architect.
  - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

### 3.02 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
  - 2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

## SECTION 014339 – MOCKUP REQUIREMENTS

### PART 1 GENERAL

#### 1.01 GENERAL

- A. Requirements set forth herein are in addition to and shall be considered as complementary to the General Conditions of the Contract and the balance of Division #1 and specifications.

#### 1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Requirements set forth herein are in addition to and shall be considered as complementary to the General Conditions of the Contract and the balance of Division #1 and specifications.
- B. Specification Sections that Require a Mockup:
  - 1. 040121 – Unit Masonry Replacement
  - 2. 066116 – Solid Surface Fabrications
  - 3. 093019 – Porcelain Tile

#### 1.03 SUBMITTALS

- A. Quality Control Submittals
  - 1. Mockup Plan: Copy of proposed plan.

#### 1.04 DEFINITIONS

- A. Mockups (General): Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances.
  - 1. Mockups are not Samples.
  - 2. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
- B. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
- C. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

#### 1.05 QUALITY ASSURANCE

- A. Mockup Plan: Detailed, dimensioned plans and elevations showing mockup size, and items and materials that will be included in proposed mockup.
- B. Pre-Construction Conference: Prior to the construction of the mockup, a conference will be called by the Director's Representative at the Site for the purpose of reviewing the requirements, and intent of mockup. The conference shall be attended by the Director's Representative, Contractor, and person supervising this phase of the Work

## PART 2 PRODUCTS (Not Used)

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish as directed.
  - 1. Build mockups in location and of size and profile indicated or, or as directed by the Owner's Representative (Construction Manager and/or Architect).
  - 2. Notify the Owner's Representative a minimum of 5 days in advance of dates and times when mockups will be constructed and able to be inspected.
  - 3. Employ supervisory personnel to oversee mockup construction. Employ same workers that will be employed during the construction of Project.
  - 4. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 5. Commence the Work after mockup has been inspected and approved in writing by Director's Representative.
  - 6. The mockup will establish the standard of quality of workmanship by which the Work will be judged.
  - 7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work. Failure to maintain the mockup, until directed, will be cause for rejection of the Work.
  - 8. Demolish and remove mockups when directed unless otherwise indicated.
- B. Mockup Types: Construct mockup in accordance with approved shop drawings, project manual, and Contract Drawings, using exact materials and methods approved for the Project, including required accessories.
  - 1. Integrated Exterior Mockups: Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections and supporting materials.
  - 2. Room Mockups: Construct mockups incorporating required materials and assemblies, finished according to requirements. Provide required lighting and additional lighting where required to enable the Owner's Representative to evaluate quality of the Work.

END OF SECTION 014339

## SECTION 014533 – CODE-REQUIRED SPECIAL INSPECTIONS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Code-required special inspections.
- B. Submittals.

#### 1.02 RELATED REQUIREMENTS

- A. Section 013300 - Submittal procedures.
- B. Section 014000 - Quality Requirements.
- C. Section 016000 - Product Requirements: Requirements for material and product quality.

#### 1.03 DEFINITIONS

- A. Code or Building Code: ICC (IBC), 2020 Building Code of New York with New York State supplements and specifically, Chapter 17 - Special Inspections and Tests.
- B. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located.
- C. National Institute of Standards and Technology (NIST).
- D. Special Inspection:
  - 1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the AHJ that also require special expertise to ensure compliance with the approved contract documents and the referenced standards.
  - 2. Special inspections are separate from and independent of tests and inspections conducted by Owner or Contractor for the purposes of quality assurance and contract administration.

#### 1.04 REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.
- B. AISC 360 - Specification for Structural Steel Buildings; 2010.
- C. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2012.
- D. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2010.
- E. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in

the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.

- F. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.
- G. ASTM E605 - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993 (Reapproved 2011).
- H. ASTM E736 - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2000 (Reapproved 2011).
- I. ASTM E2570 - Standard Test Methods for Evaluating Water-Resistive Barrier (WRB) Coatings Used under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage; 2007.
- J. AWCI 125 - Technical Manual 12-B: Standard Practice for the Testing and Inspection of Field-Applied Thin Film Intumescent Fire-Resistance Materials; 1998.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.
- L. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.
- M. ICC (IBC) - International Building Code; 2020.

#### 1.05 SUBMITTALS

- A. See Section 013300 - Submittal procedures.
- B. Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency shall:
  - 1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
  - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
  - 3. Submit certification that Special Inspection Agency is acceptable to AHJ.
- C. Smoke Control Testing Agency Qualifications: Prior to the start of work, the Testing Agency shall:
  - 1. Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
  - 2. Submit documentary evidence that agency has appropriate credentials and documented experience in fire protection engineering, mechanical engineering and HVAC air balancing.
  - 3. Submit certification that Testing Agency is acceptable to AHJ.
- D. Special Inspection Reports: After each special inspection, Special Inspector shall promptly submit two copies of report; one to Architect and one to the AHJ.

1. Include:
  - a. Date issued.
  - b. Project title and number.
  - c. Name of Special Inspector.
  - d. Date and time of special inspection.
  - e. Identification of product and specifications section.
  - f. Location in the Project.
  - g. Type of special inspection.
  - h. Date of special inspection.
  - i. Results of special inspection.
  - j. Conformance with Contract Documents.

#### 1.06 SPECIAL INSPECTION AGENCY

- A. Owner will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code.
- B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

#### PART 2 PRODUCTS - NOT USED

#### PART 3 EXECUTION

##### 3.1 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL

- A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
  1. Continuous Special Inspection: Special Inspection Agency shall be present in the area where the work is being performed and observe the work at all times the work is in progress.
  2. Periodic Special Inspection: Special Inspection Agency shall be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.
- B. Special inspections required by Section 1705 may not be required where the work is done on the premises of a fabricator registered and approved to perform such work without special inspection. Approval shall be based upon review of the fabricator's written procedural and quality control manuals and periodic auditing of fabrication practices by an approved special inspection agency. At completion of fabrication, the approved fabricator shall submit a certificate of compliance to the building official stating that the work was performed in accordance with the approved construction documents

##### 3.2 SPECIAL INSPECTIONS FOR STEEL CONSTRUCTION

- A. Special inspection for structural steel shall be in accordance with the quality assurance

inspection requirements of AISC 360

- B. High-Strength Bolting Installation: Verify items listed below comply with AISC 360, Section M2.5.
  - 1. Snug tight joints; periodic.
- C. Welding:
  - 1. Reinforcing Steel: Verify items listed below comply with AWS D1.4/D1.4M and ACI 318, Section 3.5.2.
    - a. Verification of weldability; periodic.
    - b. Reinforcing steel resisting flexural and axial forces in intermediate and special moment frames as well as boundary elements of special structural walls of concrete and shear reinforcement; continuous.
    - c. Shear reinforcement; continuous.
    - d. Other reinforcing steel; periodic.
- D. Steel Frame Joint Details: Verify compliance with approved contract documents.
  - 1. Details, bracing and stiffening; periodic.
  - 2. Member locations; periodic.
  - 3. Application of joint details at each connection; periodic.
- E. Cold formed steel trusses spanning 60 feet or more; periodic.

### 3.3 SPECIAL INSPECTIONS FOR CONCRETE CONSTRUCTION

- A. Reinforcing Steel, Including Prestressing of Tendons and Placement: Verify compliance with approved contract documents and ACI 318, Sections 3.5 and 7.1 through 7.7; periodic.
- B. Reinforcing Steel Welding: Verify compliance with AWS D1.4/D1.4M and ACI 318, Section 3.5.2; periodic.
- C. Design Mix: Verify plastic concrete complies with the design mix in approved contract documents and with ACI 318, Chapter 4 and 5.2; periodic.
- D. Concrete Sampling Concurrent with Strength Test Sampling: Each time fresh concrete is sampled for strength tests, verify compliance with ASTM C172/C172M, ASTM C31/C31M and ACI 318, Sections 5.6 and 5.8 and record the following, continuous:
  - 1. Slump.
  - 2. Air content.
  - 3. Temperature of concrete.
- E. Specified Curing Temperature and Techniques: Verify compliance with approved contract documents and ACI 318, Sections 5.11 through 5.13; periodic.
- F. Concrete Strength in Situ: Verify concrete strength complies with approved contract documents and ACI 318, Section 6.2, for the following.

- G. Formwork Shape, Location and Dimensions: Verify compliance with approved contract documents and ACI 318, Section 6.1.1; periodic.

### 3.8 SPECIAL INSPECTIONS FOR SMOKE CONTROL

- A. Test smoke control systems as follows:
  - 1. Record device locations and test system for leakage after erection of ductwork but before starting construction that conceals or blocks access to system.
  - 2. Test and record pressure difference, flow measurements, detection function and controls after system is complete and before structure is occupied.

### 3.9 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

- A. Special Inspection Agency shall:
  - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
  - 2. Perform specified sampling and testing of products in accordance with specified reference standards.
  - 3. Ascertain compliance of materials and products with requirements of Contract Documents.
  - 4. Promptly notify Architect and Contractor of observed irregularities or non-conformance of work or products.
  - 5. Perform additional tests and inspections required by Architect.
  - 6. Submit reports of all tests or inspections specified.
- A. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.
- B. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

### 3.10 CONTRACTOR DUTIES AND RESPONSIBILITIES

- A. Contractor Responsibilities, General:
  - 1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
  - 2. Cooperate with agency and laboratory personnel; provide access to the work, to manufacturers' facilities, and to fabricators' facilities.
  - 3. Provide incidental labor and facilities:
    - a. To provide access to work to be tested or inspected.
    - b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
    - c. To facilitate tests or inspections.
    - d. To provide storage and curing of test samples.

4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.
5. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

# Statement of Special Inspections

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Project:

Location:

Owner:

Design Professional in Responsible Charge:

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection Coordinator and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

- Structural                       Mechanical/Electrical/Plumbing  
 Architectural                       Other: \_\_\_\_\_

The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency:

or  per attached schedule.

Prepared by:

\_\_\_\_\_  
(type or print name)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date



Owner's Authorization:

Building Official's Acceptance:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

CASE Form 101 • Statement of Special Inspections • ©CASE 2004

# Schedule of Inspection and Testing Agencies

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- |  |   |
|--|---|
| <input checked="" type="checkbox"/> Soils and Foundations  | <input checked="" type="checkbox"/> Spray Fire Resistant Material |
| <input checked="" type="checkbox"/> Cast-in-Place Concrete | <input type="checkbox"/> Wood Construction                        |
| <input checked="" type="checkbox"/> Precast Concrete       | <input type="checkbox"/> Exterior Insulation and Finish System    |
| <input checked="" type="checkbox"/> Masonry                | <input type="checkbox"/> Mechanical & Electrical Systems          |
| <input checked="" type="checkbox"/> Structural Steel       | <input type="checkbox"/> Architectural Systems                    |
| <input type="checkbox"/> Cold-Formed Steel Framing         | <input type="checkbox"/> Special Cases                            |

Special Inspection Agencies	Firm	Address, Telephone, e-mail
1. <b>Special Inspection Coordinator</b>		
2. Inspector		
3. Inspector		
4. Testing Agency		
5. Testing Agency		
6. Other		

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work.

Item	Agency # (Qualif.)	Scope
1. Shallow Foundations	PE/GE	<p><i>Inspect soils below footings for adequate bearing capacity and consistency with geotechnical report.</i></p> <p><i>Inspect removal of unsuitable material and preparation of subgrade prior to placement of controlled fill</i></p>
2. Controlled Structural Fill	PE/GE	<p><i>Perform sieve tests (ASTM D422 &amp; D1140) and modified Proctor tests (ASTM D1557) of each source of fill material.</i></p> <p><i>Inspect placement, lift thickness and compaction of controlled fill.</i></p> <p><i>Test density of each lift of fill by nuclear methods (ASTM D2922)</i></p> <p><i>Verify extent and slope of fill placement.</i></p>

Item	Agency # (Qualif.)	Scope
1. Mix Design	ACI-CCI ICC-RCSI	<i>Review concrete batch tickets and verify compliance with approved mix design. Verify that water added at the site does not exceed that allowed by the mix design.</i>
2. Material Certification		
3. Reinforcement Installation	ACI-CCI ICC-RCSI	<i>Inspect size, spacing, cover, positioning and grade of reinforcing steel. Verify that reinforcing bars are free of form oil or other deleterious materials. Inspect bar laps and mechanical splices. Verify that bars are adequately tied and supported on chairs or bolsters</i>
4. Welding of Reinforcing	AWS-CWI	<i>Visually inspect all reinforcing steel welds. Verify weldability of reinforcing steel. Inspect preheating of steel when required.</i>
5. Anchor Rods		<i>Inspect size, positioning and embedment of anchor rods. Inspect concrete placement and consolidation around anchors.</i>
6. Concrete Placement	ACI-CCI ICC-RCSI	<i>Inspect placement of concrete. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated.</i>
7. Sampling and Testing of Concrete	ACI-CFTT ACI-STT	<i>Test concrete compressive strength (ASTM C31 &amp; C39), slump (ASTM C143), air-content (ASTM C231 or C173) and temperature (ASTM C1064).</i>
8. Curing and Protection	ACI-CCI ICC-RCSI	<i>Inspect curing, cold weather protection and hot weather protection procedures.</i>

Item	Agency # (Qualif.)	Scope
1. Plant Certification / Quality Control Procedures <input type="checkbox"/> Fabricator Exempt	ACI-CCI ICC-RCSI	<i>Review plant operations and quality control procedures.</i>
2. Mix Design	ACI-CCI ICC-RCSI	<i>Inspect concrete batching operations and verify compliance with approved mix design</i>
3. Material Certification		
4. Reinforcement Installation	ACI-CCI ICC-RCSI	<i>Inspect size, spacing, position and grade of reinforcing steel. Verify that reinforcing bars are free of form oil or other deleterious materials.</i>
5. Prestress Operations	ICC-PCSI	<i>Inspect placement, stressing, grouting and protection of prestressing tendons</i>
6. Connections / Embedded Items		
7. Formwork Geometry		
8. Concrete Placement	ACI-CCI ICC-RCSI	<i>Inspect placement of concrete. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated .</i>
9. Sampling and Testing of Concrete	ACI-CFTT ACI-STT	<i>Test concrete compressive strength (ASTM C31 &amp; C39), slump (ASTM C143), air-content (ASTM C231 or C173) and temperature (ASTM C1064).</i>
10. Curing and Protection	ACI-CCI ICC-RCSI	<i>Inspect curing, cold weather protection and hot weather protection procedures.</i>
11. Erected Precast Elements	PE/SE	<i>Inspect erection of precast concrete including member configuration, connections, welding and grouting.</i>

# Masonry

Required Inspection Level:  1  2

Page of

Item	Agency # (Qualif.)	Scope
1. Material Certification		
2. Mixing of Mortar and Grout	ICC-SMSI	<i>Inspect proportioning, mixing and retempering of mortar and grout.</i>
3. Installation of Masonry	ICC-SMSI	<i>Inspect size, layout, bonding and placement of masonry units.</i>
4. Mortar Joints	ICC-SMSI	<i>Inspect construction of mortar joints including tooling and filling of head joints.</i>
5. Reinforcement Installation	ICC-SMSI AWS-CWI	<i>Inspect placement, positioning and lapping of reinforcing steel. Inspect welding of reinforcing steel.</i>
6. Grouting Operations	ICC-SMSI	<i>Inspect placement and consolidation of grout. Inspect masonry clean-outs for high-lift grouting.</i>
7. Weather Protection	ICC-SMSI	<i>Inspect cold weather protection and hot weather protection procedures. Verify that wall cavities are protected against precipitation.</i>
8. Evaluation of Masonry Strength	ICC-SMSI	<i>Test compressive strength of mortar and grout cube samples (ASTM C780). Test compressive strength of masonry prisms (ASTM C1314).</i>
9. Anchors and Ties	ICC-SMSI	<i>Inspect size, location, spacing and embedment of dowels, anchors and ties.</i>
10. Anchors and Ties	ICC-SMSI	<i>Inspect size, location, spacing and embedment of dowels, anchors and ties.</i>

Item	Agency # (Qualif.)	Scope
1. Fabricator Certification/ Quality Control Procedures <input type="checkbox"/> Fabricator Exempt	AWS/AISC- SSI ICC-SWSI	<i>Review shop fabrication and quality control procedures.</i>
2. Material Certification	AWS/AISC- SSI ICC-SWSI	<i>Review certified mill test reports and identification markings on wide-flange shapes, high-strength bolts, nuts and welding electrodes</i>
3. Open Web Steel Joists		<i>Inspect installation, field welding and bridging of joists.</i>
4. Bolting	AWS/AISC- SSI ICC-SWSI	<i>Inspect installation and tightening of high-strength bolts. Verify that splines have separated from tension control bolts. Verify proper tightening sequence. Continuous inspection of bolts in slip-critical connections.</i>
5. Welding	AWS-CWI  ASNT	<i>Visually inspect all welds. Inspect pre-heat, post-heat and surface preparation between passes. Verify size and length of fillet welds.</i>  <i>Ultrasonic testing of all full-penetration welds.</i>
6. Structural Details	PE/SE	<i>Inspect steel frame for compliance with structural drawings, including bracing, member configuration and connection details.</i>
7. Metal Deck	AWS-CWI	<i>Inspect welding and side-lap fastening of metal roof and floor deck.</i>

# Spray-Applied Fire Resistant Material

Item	Agency # (Qualif.)	Scope
1. Material Specifications		
2. Laboratory Tested Fire Resistance Design	ICC-SFSI	<i>Review UL fire resistive design for each rated beam, column, or assembly.</i>
3. Schedule of Thickness	ICC-SFSI	<i>Review approved thickness schedule.</i>
4. Surface Preparation	ICC-SFSI	<i>Inspect surface preparation of steel prior to application of fireproofing</i>
5. Application	ICC-SFSI	<i>Inspect application of fireproofing.</i>
6. Curing and Ambient Condition	ICC-SFSI	<i>Verify ambient air temperature and ventilation is suitable for application and curing of fireproofing.</i>
7. Thickness	ICC-SFSI	<i>Test thickness of fireproofing (ASTM E605). Perform a set of thickness measurements for every 1,000 SF of floor and roof assemblies and on not less than 25% of rated beams and columns.</i>
8. Density	ICC-SFSI	<i>Test the density of fireproofing material (ASTM E605).</i>
9. Bond Strength	ICC-SFSI	<i>Test the cohesive/adhesive bond strength of fireproofing ASTM E736). Perform not less than one test for each 10,000 SF.</i>

END OF SECTION 014533

## SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.
- B. Temporary utilities include, but are not limited to, the following:
  - 1. Sewers / septic and drainage.
  - 2. Water Service and distribution.
  - 3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
  - 4. Ventilation.
  - 5. Electric power service.
  - 6. Lighting.
  - 7. Temporary Heating.
- C. Security and protection facilities include, but are not limited to, the following:
  - 1. Environmental protection.
  - 2. Stormwater control.
  - 3. Site enclosure fence.
  - 4. Security enclosure and lockup.
  - 5. Barricades, warning signs, and lights.
  - 6. Temporary enclosures.
  - 7. Temporary partitions.
  - 8. Fire protection.
- D. Unless work of this section is indicated to be provided under a specific contract, each Prime Contractor must provide, maintain and remove required temporary facilities necessary to perform his own construction activities.
- E. Accessible Temporary Egress: Comply with applicable provisions in ICC/ANSI A117.1.

#### 1.2 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and 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.

6. NYS SED 155.5

- B. Standards: 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. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."
- C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.3 PROJECT CONDITIONS

- A. Temporary Utilities: Each contractor will prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.
- 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-preventive measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist onsite.

1.4 DIVISION OF RESPONSIBILITIES

- A. General: These Specifications assign the Contractor responsibilities.
- B. Each Prime Contractor is responsible for the following:
  - 1. Installation, operation, maintenance and removal of each temporary facility considered as its own normal construction activity, as well as the costs and use charges except as listed below.
  - 2. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
  - 3. Its own storage, Conex boxes and fabrication sheds. (Locate / Move as directed by CM)
  - 4. Hoisting requirements, including hoisting loads in excess of 2 tons, hoisting material or equipment into spaces below grade, and hoisting requirements outside the building enclosure. (Rigging insurance must be provided when contractor hoisting equipment)
  - 5. Collection and disposal of its own hazardous, dangerous, unsanitary, and all waste material.
  - 6. Secure lock-up of its own tools, materials and equipment.
  - 7. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.
  - 8. Maintaining temporary facilities provided by Contractor.
  - 9. Complying with the regulations of the Commissioner of Education - 8 NYCRR 155.5 - Uniform Safety Standards for School Construction and Maintenance Projects specified in Division 1 Section "01 50 00 – Uniform Safety Standards for School Construction."

10. Containers for non-hazardous waste and debris generated by their own demolition and construction operations.

## 1.5 USE CHARGES

- A. General: Cost or use charges for temporary facilities are not chargeable to Owner, Architect or Construction Manager and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
  1. The Architect and Construction Manager
  2. Other Contractors.
  3. Owners construction forces, including testing agencies
  4. Personnel of authorities having jurisdiction.
- B. Water Service: Use water from the Owner's existing water system without metering and without payment of use charges. Access to water shall be approved by the Owner.
- C. Electric Power Service: Temporary electric power including set-up and maintenance is the responsibility of the Electrical Contractor. Use charges by owner

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Provide new materials. If acceptable to the Architect / CM, the Contractor may use undamaged, previously used materials in good condition. Provide materials suitable for use intended.
- B. Lumber and Plywood:
  1. For signs and directory boards, provide exterior-type, Grade B-B high density concrete form overlay plywood of sizes and thicknesses indicated.
  2. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch-thick exterior plywood.
- C. Paint: Paint surfaces exposed to view from Owner occupied areas.
- D. 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.
- E. Temporary Roofing – minimum ½” gypsum sheeting and 30 mil reinforced EPDM membrane.

### 2.2 EQUIPMENT

- A. 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.
- B. 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.

## PART 3 - EXECUTION

### 3.1 TEMPORARY UTILITY INSTALLATION

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve Protect adequately and result in minimum interference with performance of the work. Relocate and modify facilities as required.
- B. 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.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

### 3.2 CONTRACTOR FIELD OFFICES

- A. Space is severely limited. Contractor may with permission from the Owner and construction manager establish a field office for their own use. Said offices for the individual prime contractor, sub contractors, specialty contractors and the like shall be of such size and design as approved by the owner and architect and shall be located in the Construction Managers designated staging area. Each representative contractor will arrange for telephone service and electric service, if required, directly with the utility company. (No field offices or storage trailers will be allowed by the buildings.)
- B. Maintain, in the contractor's field office, all articles for First Aid treatment. The contractor shall also establish standing arrangements for the immediate removal and hospital treatment of any employees and other persons on the job site who may be injured or who may become ill during the course work.

### 3.3 TEMPORARY AND PERMANENT SERVICES, GENERAL

- A. The Contractor's use of any permanent system or service of the building or portions thereof shall be subject to the Owners approval.
- B. The Contractor shall be responsible for any and all damage to permanent services used, and shall make good any and all damage to the satisfaction of the owner, prior to final completion and acceptance.
- C. NOTE - In accordance with OSHA and other applicable regulations, the representative Contractors performing erection of "skeleton" type work are solely responsible for the netting, guard rail protection and such other safety devices as deemed necessary to protect the workers and public from harm.

### 3.4 TEMPORARY LIGHT AND POWER

- A. Temporary Electric Power Service: **Electrical Contractor** shall provide and pay all costs to provide a weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics to accommodate performance of work during the construction period.
  - 1. Responsibility: All work under this section to be provided by the **Electrical Contractor**.
  - 2. Applicability: This section applies to all renovation and new construction work areas for this Project.

3. Electrical Contractor shall make arrangements with utility company for temporary and permanent services immediately after award of contract.
4. Temporary or permanent services for temporarily or permanently installed building equipment such as sump pumps, boilers, cabinet heating and/ or cooling units and fans shall be furnished, installed, operated and maintained so that the said equipment may be operated for drainage and temporary heat when required and/ or when so ordered by the Architect/ Construction Manager.
5. Electrical Contractor shall maintain all parts of the electrical system (temporary and permanent) active and in-service at all times throughout the contract duration. All temporary lighting to be controlled by standard switches per code (outside of power panels).
6. Electrical contractor shall provide temporary generator power to maintain power during the electric panel change over. This includes all electric service in the building (power, fire alarm, lighting, communication, information technology, heating units, etc). Contractor shall assume a minimum 50 kw generator(s) and temporary panels as necessary. Generators shall be located at the building exterior. Provide feeder cables, adequately sized, in accordance with NEC to feed temporary panels or existing sub-panels. Contractor shall include required fuel for operation.
7. Electrical Contractor shall maintain power during the hours established by Construction Manager.
8. Temporary Service: Install service and grounding in compliance with the National Electric Code (NFPA 70). Include necessary meters, transformers, overload protected disconnect and main distribution switch gear. Comply with all NECA, NEMA and UL Standards
9. Provide temporary service with an automatic ground-fault interrupter feature, activated from the circuits of the system.
10. Power Distribution System: Provide circuits of adequate size and proper characteristics for each use. In general run wiring overhead. Rise vertically where wiring will be least exposed to damage from construction operations.
11. Provide metal conduit, tubing or armored cable for protection of temporary power wiring where exposed to possible damage during construction operations. Where permitted by code, wiring of circuits not exceeding 110-120 Volt 20 Amp rating and wiring of lighting circuits may be non-metallic sheathed cable in areas where located overhead and exposed. Do not wire temporary lighting with plain, exposed (insulated) electrical conductors. Provide metal enclosures or boxes for wiring devices.
12. Provide overload-protected disconnect switch as required by code.
13. For power hand tools and task lighting, provide temporary 4-gang outlets at each floor level, spaced so that a 100-foot extension cord can reach each work area. Provide separate 110-120 Volt, 20 Amp circuit for each 4-gang outlet (4 outlets per circuit).
14. Maintaining all existing systems, including but not limited to, power, lighting, fire alarm, intercom, etc., within the existing building operational at all times for Owner occupancy and construction.

#### B. TEMPORARY ELECTRICAL AND TELEPHONE SERVICES

1. Temporary Power Source: At each building / renovation area, use the existing electrical power distribution system for temporary power source.
2. Owner's Requirements: Do not disrupt the Owner's needs for continuous power at each building.

3. Electrical Contractor shall provide temporary power and lighting facilities for use of all trades. All temporary light and power shall be in accordance with the required Codes and Safety Standards.
4. Electrical Contractor will include in their base bid: Construction Manager trailer disconnect and wire removal at conclusion of the project.
5. All other contractor trailer use / connection charges for power and telephone to be paid for by the respective contractor.

C. RECEPTACLE REQUIREMENTS

1. General Requirements: Provide temporary receptacle outlets as required Minimum Requirements: Provide a minimum of one quad 120-volt receptacle per 2500 square feet of building floor area, with maximum spacing of 50 feet on center for operation of portable tools and appliances during the construction period.
2. Branch Circuits: All temporary receptacle branch circuits to be rated 20 amps with a maximum of (3) duplex receptacles per circuit. Temporary receptacle branch circuits shall be independent of temporary lighting circuits.

D. LIGHTING REQUIREMENTS

1. General Requirements: Electrical Contractor shall provide both interior and exterior lighting at areas where existing lighting has been removed and at new construction areas, as required to provide adequate illumination for safe and proper construction operations and Project Site security.
2. Minimum Requirements: Provide illumination levels adequate for construction operations and safe traffic conditions. As a minimum provide one 200-watt lamp per 400 square feet of building floor area, with maximum spacing of 20 feet. Any rooms in excess of 500 sf will receive one 400-watt metal halide fixture for each 1000 sf of area.
3. Stairways: Provide one 200-watt lamp per landing at each stairway and covered walkway.
4. Supplemental Lighting: If required, supplemental lighting beyond minimum requirements shall be provided via suitable portable lighting units with cord and plugs, and shall be paid for by the Contractor or Sub- Contractor requiring such additional lighting.
5. Restrictions: Do not use permanent lighting systems for temporary construction lighting purposes.

E. MAXIMUM LOADS

1. General: Lighting and power loads connected to the temporary power distribution system shall be limited to the following maximum individual loads:
 

a.	Load Type	Maximum
b.	120 volt, 1-phase	1.5 KVA
c.	208 volt, 1-phase	2.5 KVA
d.	208 volt, 3-phase	5.0 KVA
2. General: The temporary power distribution system shall be sufficiently sized to provide temporary power as required within this section. Meter and Meter connections to be part of electrical contractors' base bid.

F. ELECTRICAL WELDERS

1. Separate Power Sources Required: Power for electric welders and for other loads larger than the maximum allowable sizes shall be taken from portable power sources provided,

paid for and operated by the Contractor or Sub-Contractor requiring the use of such equipment. Remove such power sources when no longer needed.

G. ELECTRICAL ENERGY COSTS

1. Paid By Owner: Charges for electrical energy usage for temporary power and lighting will be paid by the Owner, when taken from the Owner's electrical services. Contractor and Sub-Contractors shall exercise measures to conserve energy usage. Use of owner electric for items not specific to project (e.g. heating construction shanties, etc.) will not be permitted

3.5 TEMPORARY TOILET FACILITIES

- A. Sanitary Facilities: Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with governing regulations including safety and health codes for the type, number, location, operation and maintenance of fixtures and facilities; provide not less than specified requirements. Install in locations which will best serve the project's needs. Existing facilities should not be used.
- B. Responsibilities: The **General Contractor** is responsible for temporary sanitary facilities and their maintenance, cleaning and supplies for use by all trades. Sufficient quantity/locations to properly handle the amount of workers onsite.
- C. Supply and maintain toilet tissue, paper towels, paper cups and other disposable materials as appropriate for each facility, including Owner's Representative's temporary offices for full contract duration. Provide covered waste containers for used material.
- D. Provide separate toilet facilities for male and female construction personnel.

3.6 TEMPORARY HEATING

- A. The **Mechanical Contractor** will maintain 60-degree temperature in all areas via temporary or permanent systems. The Mechanical Contractor will submit a detailed plan including sketches indicating his proposed temporary heating system for engineer approval within 4 weeks of contract award. The **Electrical Contractor** will provide permanent or temporary power for Mechanical Contractor's units for temporary heating. The fuel, equipment, materials, operating personnel and methods used therefore shall be at all times satisfactory to the Architect and Construction Manager and adequate for the purpose intended. The use of electric heaters is not acceptable. All required fuel is part of the Mechanical contract.
- B. The Contractor shall maintain the critical installation temperatures provided in the technical provisions of the specifications herein for all work in those areas where same is being performed.
- C. The maintenance of proper heating, ventilation and adequate drying out of the work is the responsibility of the contractor and any work damaged by dampness, insufficient or abnormal heating, shall be replaced to the satisfaction of the Architect by and at the sole expense of the contractor.
- D. Before and during the placing of gypsum and the application of other interior finishes, taping, varnishing, painting, etc. and until final acceptance by the Owner of all work covered by the Contract, the contractor shall, unless otherwise specified in the contract documents, maintain a temperature of 65 degrees F. Coordinate with Division 9 of the Technical Specifications.

- E. Use of the permanent system, if approved by engineer and owner permission granted, shall not shorten, or negate any equipment, or system guarantees required under this contract. (the warranty period starts upon date of substantial completion). Two additional filter changes are to be provided by Mechanical Contract. A program of use, maintenance and restoration will be submitted with request for use of systems for temporary services.

### 3.7 TEMPORARY WATER

- A. The Plumbing Contractor shall:
  - 1. Provide and maintain a temporary water system of size and capacity as required below to supply the needs of all Contractors for the work.
  - 2. Provide no less than two 3/4-inch hose bibs conveniently located at each building wing.
  - 3. Provide and pay for all connections and permits.
  - 4. Protect temporary and permanent lines against any damage.
  - 5. Water source is only available from building. If contractor decides distance is too far he should use water storage tanks or struck at no additional charge to the owner.
- B. Each Contractor shall:
  - 1. Provide all hose and other extensions from connections installed by the Plumbing Contractor and all labor, materials and supplies required to supply water to the work.
  - 2. Prevent water damage to the work.

### 3.8 STORAGE FACILITIES

- A. Each Contractor shall provide temporary storage shanties, tool houses and other facilities as required for their own use. Temporary structures shall be located at the Construction Manager's designated staging area, and shall be removed upon completion of the work or when directed.
- B. Materials delivered to the site shall be safely stored and adequately protected against loss or damage in watertight, lockable, Conex boxes. Particular care shall be taken to protect and cover materials that are liable to be damaged by the elements.
- C. Due to limited on site storage space, each Contractor shall coordinate delivery of his materials with the Construction Manager who will determine when large deliveries shall be made and shall be designate storage locations on site for delivered materials. All stored materials must be stored in locked, watertight trailers, paid for by applicable contractor.

### 3.9 SCAFFOLDING AND STAGING

- A. All scaffold, staging and appurtenances thereto shall comply in total to the requirements of Safety and Health Regulations for Construction Chapter XVII of OSHA, Part 1926 and all related amendments.

### 3.10 RUBBISH CONTAINER

- A. Each Contractor shall provide suitable rubbish container device(s) for his own use (both demolition and construction debris), properly maintained and serviced, replaced as required and protected from access by the public fencing as may be specified herein or approved by the Architect or Construction Manager.

- B. Contractor and Subcontractor shall sweep up and gather together daily all his own rubbish and removed materials and place same in containers.

### 3.11 CONSTRUCTION FENCING

- A. Construction fencing and barriers shall be provided by the **General Contractor**, enclosing all work and storage areas as outlined in staging plan at the end of this section and specified within. Temporary construction fencing shall be of good quality and neat in appearance; 8' high chain link fencing, 9 ga fabric on stanchions with vision barrier screening fabric securely fastened. (Post driven installation where approved by CM) Open-Mesh Chain Link Fencing: Provide 0.120-inch-thick, galvanized steel posts, and 2.875" dia. Gate posts. Provide lockable gates. (Keys to owner, architect and CM)
- B. Site access gates shall be provided as required, complete with all operating hardware and security devices.
- C. Should fencing be required to be relocated or modified during the course of the project due to additional access needed by the contractor, same shall be done at the total expense of the contractor.
- D. The General Work Contractor shall provide a 50' x 100' temporary fence area with 2 ea 10' wheeled gates where directed by the CM. All fenced areas to be 6' high 9 ga. Chain link fence on stations.

### 3.12 JANITORIAL SERVICE/DAILY CLEANUP

- A. Each Contractor shall furnish daily janitorial services for the project and perform any required maintenance of facilities as deemed necessary by the Architect and Construction Manager during the entire life of the contract. If any contractor fails to keep the site safe and broom clean within 4 hours of being notified by CM, either verbally or in writing, the construction manager will have the cleanup work performed by others and the contractors will be back charged accordingly.
  - 1. In addition to the above, the **General Contractor** shall provide a daily sweep and a weekly damp mop of all work areas.

### 3.13 BURNING

- A. Burning will not be permitted.

### 3.14 FIRE PREVENTION CONTROL

- A. Each Contractor shall comply with the safety provisions of the National Fire Protection Association's "National Fire Codes" pertaining to the work and, particularly, in connection with any cutting or welding performed as part of the work.

### 3.15 TEMPORARY FIRE PROTECTION

- A. Each Contractor shall take all possible precautions for the prevention of fires.
  - 1. Where flame cutting torches, blow torches, or welding tools are required to be used, their use shall be as approved by the Construction Manager at the site.

2. When welding tools or torches of any type are in use, have available in the immediate vicinity of the work a fire extinguisher of the dry chemical 20 lbs. Type. The fire extinguisher(s) shall be provided and maintained by the Contractor doing such work.
- B. Fuel for cutting and heating torches shall be gas only and shall be contained in Underwriters laboratory approved containers.
  - C. No volatile liquids shall be used for cleaning agents or as fuels for motorized equipment or tools within a building except with the express approval of the Owner and/or Architect and in accordance with local codes. On-site bulk storage of volatile liquids shall be outside the buildings at locations directed by the Owner, who shall determine the extent of volatile liquid allowed within the building at any given time.
  - D. Each Contractor shall comply with the following requirements relating to compressed gas:
    1. Where compressed gas of any type is used for any purpose at the site, it shall be contained in cylinders complying with ICC regulations. Gases of different types shall not be stored together except when in use and when such proximity is required.
    2. All persons required to handle gas cylinders or to act as temporary firemen (Fire Watchers) shall be able to read, write and understand the English language; they shall also be required by the Contractor to read Part 3 of Pamphlet P-1 "Safe Handling of Compressed Gases" published by the Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.
  - E. Each Contractor shall comply with the following requirements relating to welding and cutting:
    1. All cutting and/or welding (electric or gas) must be done only by skilled, certified and licensed personnel.
    2. During welding or cutting operations, a contractor's man shall act as a fire watcher. The fire watcher shall have proper eye protection and suitable firefighting equipment including fire extinguisher (bearing current inspection Certificate), protective gloves and any other equipment deemed necessary.
    3. Tanks supplying gases for welding or cutting are to be placed in an upright position securely fastened, and close as practical to the operation. Tanks, actives or spares, shall be protected from excess heat and shall not be placed in stairways, hallways or exits. When not in use, protective valve cap shall be screwed on the cylinder.
    4. Adequate fire extinguishing equipment shall be maintained at all welding or cutting operations.

### 3.16 VENTILATION AND HUMIDITY CONTROL FOR CONSTRUCTION:

- A. **General Contractor** will provide temporary ventilation as required for protecting the building from any adverse effects of high humidity during abatement and construction activities. Select dehumidification and ventilating equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements and have sufficient quantity of units to produce necessary ambient conditions.
  1. Each Contractor shall be responsible for his own temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity.
  2. Ventilate enclosed area to dissipate humidity, and to prevent accumulation of dust, fumes, vapors or gases.

3. Provide equipment as necessary for air and fresh exchange for the work area per OSHA standards.
4. If Contractor fails to adequately ventilate the building during the construction, abatement / roofing process, thereby causing humidity and possible mold issues, the owner will hire others to properly address and deduct costs from the Contractor accordingly.
5. **Dustproof Environment** - The construction will be taking place next to an occupied gymnasium thus the General Contractor will provide and maintain a negative air environment and machines of sufficient size/qty to properly ventilate the square footage of work areas and exhaust any dust/fumes through flexible duct hose to the exterior to completely eliminate any dust/odors/smoke. This includes properly sealing windows, doors and opening to create a negative air environment.
6. Any contractor whom allows water infiltration to building is responsible for cleanup and commercial dehumidifiers of sufficient size/qty to prevent mold growth. Failure to immediately address (4 hours notice) will result in the owners hiring others and backcharging in order to insure a safe environment.

### 3.17 TEMPORARY ROADS AND PERMANENT PAVED AREAS:

- A. **General Contractor** shall construct and maintain temporary road areas adequate to support loads and to withstand exposure to traffic during construction period.
  1. Temporary roads/ staging areas will consist of one-layer soil separation fabric, 8" of compacted NYS DOT Item 4. Contractor will maintain and field dress with additional material as necessary to prevent ruts and potholes.
  2. Includes access for delivery through staging area to building work areas, and to equipment and storage areas and sheds.
  3. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
  4. Road Cleaning: Maintain roads and walkways in an acceptably clean condition. This includes the removal of debris daily, if required, and/or a minimum of once a week due to all project traffic. Road cleaning equipment to be wet/vacuum type. The General Contractor will clean roads for debris from building-related activities.
  5. Staging Areas:  
Temporary parking by construction personnel shall be allowed only in areas so designated.

### 3.18 DE-WATERING FACILITIES AND DRAINS

- A. Each Prime Contractor is directly responsible for de-watering of their excavations. The responsibility of de-watering of the site as to facilitate the work will be the responsibility of the General Contractor, coordinate with CM.
- B. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining property nor endanger permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.
- C. Remove snow and ice as required to minimize accumulations.

### 3.19 ROOF PROTECTIONS

- A. All Contractors shall provide temporary protection on the roof surface when it is necessary for work to take place on completed sections. (Minimum 2" rigid insulation and plywood)
- B. Upon such notification as required in subparagraph A, the Contractor shall assume responsibility for damages, if any, to the roofing system caused by the work of other trades, except that financial liability for any and all damages rests with the offending trade.

### 3.20 TEMPORARY SITE SAFETY AND DIRECTIONAL SIGNS

- A. The **General Contractor** shall provide signs as required below. Install signs where required or indicated to inform public and persons seeking entrance to project. All signage and posts become the property of the owner at the conclusion of the project.
- B. Construct signs in accordance with section 619 of the NYS DOT standard specifications (MUTCD overall sign size, letter size, metal signage). Support on breakaway metal posts or attach to fencing; do not attach signs to buildings or permanent construction.
- C. Include relocating temporary site safety and directional signs as many times as required or directed.
- D. For construction traffic control/flow at entrances/exits, as designated by the Owner (2 required) Large sign 4' x4' Orange with Black Letters ("Construction Entrance Only")
- E. For construction parking (2 required)
- F. To direct deliveries (4 required)
- G. Emergency egress only – Construction area (4 required)
- H. Per OSHA standards as necessary
- I. For "No Smoking" safe work site at multiple locations (4 required)
- J. Construction Area – Do Not Enter (10) mount on fence
- K. No Trespassing (10) mount on fence
- L. A premobilization meeting to establish location and quantities of all signage will be held with contractor, Construction Manager, and owner. Prior to the start of any actual work the signage must be reviewed / approved by the Construction Manager.

### 3.21 STORMWATER CONTROL

- A. Plumber will maintain roof drain run-off during relocation of roof storm piping.

### 3.22 BARRICADES, WARNING SIGNS AND LIGHTS:

- A. Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard.
  - 1. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch-(16-mm-) thick exterior plywood.

### 3.23 TEMPORARY ENCLOSURES

- A. Mechanical Contractor will provide temporary watertight enclosures for protection of construction, from exposure, foul weather and safety for any roof related openings. Close openings in roof deck with load bearing wood framed construction, ¾" plywood and watertight membrane
- B. General Contractor will provide temporary 2" x4" wood framing, 2" polyiso insulation, ½" plywood, and cover with 6 mil plastic; at any open exterior window removal, wall removal, door entrance locations, etc. for weather and security protection at the end of each workday.
- C. Any other temporary enclosures for specific openings for a contractor to perform their work are the responsibility of the contractor creating the opening and shall be installed to protect the building from exterior elements, security issues, odors / noise resulting from construction.

### 3.24 TEMPORARY PARTITIONS and FLOOR PROTECTIONS

- A. **General Contractor** shall erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate work areas from fumes.
  - 1. Construct dustproof, floor to ceiling partitions of not less than 3-5/8" – 20 ga. studs, 2 layers of 6 mil poly sheets inside / outside, sound batt insulation, exterior sheathing 5/8" plywood, interior sheathing 5/8" gypsum taped/painted where owner occupied. Caulk seal joints and perimeter to prevent dust migrations. Equip partitions with dustproof doors and security locks.
  - 2. Cover floor with 2-layer poly and extend up the side 18". Overlap and tape full length joints
  - 3. In addition to any temporary partition locations shown on drawings, General Contractor will include in his base bid 4 ea. 9' x12' temporary partitions meeting the above criteria for use where directed.
  - 4. Floor Protections – Shall be "Ram-Board" **Heavy Duty** with taped joints or equivalent. Finish Flooring (new or existing) will be fully covered by GC. Areas of isolated MEP work will be protected with Ram- Board by the individual prime contractor

### 3.25 AREAS OF SPECIAL PROTECTION:

- A. 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

### 3.26 ENVIRONMENTAL PROTECTION:

- A. 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 use of 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.

3.27 OPERATION, TERMINATION, AND REMOVAL

- 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. Termination and Removal: Unless the Architect/ CM requests that it be maintained longer, remove each temporary facility when the need has ended or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been affected 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 Contractors property.
  - 2. At Substantial Completion, clean and renovate permanent facilities used during the construction period including.

END OF SECTION 015000

## SECTION 016000 – PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
  - 1. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
  - 2. Divisions 02 through 26 Sections for specific requirements for warranties on products and installations specified to be warranted.

#### 1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, which is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility.
  - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

## 1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
  2. Form: Tabulate information for each product under the following column headings:
    - a. Specification Section number and title.
    - b. Generic name used in the Contract Documents.
    - c. Proprietary name, model number, and similar designations.
    - d. Manufacturer's name and address.
    - e. Supplier's name and address.
    - f. Installer's name and address.
    - g. Projected delivery date or time span of delivery period.
    - h. Identification of items that require early submittal approval for scheduled delivery date.
  3. Initial Submittal: Within thirty (30) days after date of commencement of the Work, submit three (3) copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
    - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
  4. Completed List: Within sixty (60) days after date of commencement of the Work, submit three (3) copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
  5. Architect's Action: Architect will respond in writing to Contractor within fifteen (15) days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use CSI Form 13.1A.
  2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified material or product cannot be provided.
    - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
  - e. Samples, where applicable or requested.
  - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
  - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
  - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
  - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
  - j. Cost information, including a proposal of change, if any, in the Contract Sum.
  - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
  - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within ten (10) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
- a. Form of Acceptance: Change Order.
  - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect of approval or rejection of proposed comparable product request within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
- a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
  - b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.
- D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

## 1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products

previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

#### 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
- C. Storage:
  1. Store products to allow for inspection and measurement of quantity or counting of units.
  2. Store materials in a manner that will not endanger Project structure.
  3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
  4. Store cement products and materials on elevated platforms.
  5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
  6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  7. Protect stored products from damage and liquids from freezing.
  8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

#### 1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
  - 1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  - 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
  - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
  - 3. Refer to Divisions 02 through 26 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
  - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
  - 4. Where products are accompanied by the term "as selected," Architect will make selection.
  - 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
  - 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
  - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
  - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received within thirty (30) days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
  2. Requested substitution does not require extensive revisions to the Contract Documents.
  3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  4. Substitution request is fully documented and properly submitted.
  5. Requested substitution will not adversely affect Contractor's Construction Schedule.
  6. Requested substitution has received necessary approvals of authorities having jurisdiction.
  7. Requested substitution is compatible with other portions of the Work.
  8. Requested substitution has been coordinated with other portions of the Work.
  9. Requested substitution provides specified warranty.
  10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

## 2.3 COMPARABLE PRODUCTS

- A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
  2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as

performance, weight, size, durability, visual effect, and specific features and requirements indicated.

3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

END OF SECTION 016000

## SECTION 017300 – EXECUTION REQUIREMENTS

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. General installation of products.
  - 4. Coordination of Owner-installed products.
  - 5. Progress cleaning.
  - 6. Starting and adjusting.
  - 7. Protection of installed construction.
  - 8. Correction of the Work.
- B. Related Sections include the following:
  - 1. Division 1 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
  - 2. Division 1 Section "Submittal Procedures" for submitting surveys.
  - 3. Division 1 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
  - 4. Division 1 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
  - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
    - a. Description of the Work.
    - b. List of detrimental conditions, including substrates.
    - c. List of unacceptable installation tolerances.
    - d. Recommended corrections.
  - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  - 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.02 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field

measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

### 3.03 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Construction Manager promptly.
- B. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- C. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.

### 3.04 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
  - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

### 3.05 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  1. Make vertical work plumb and make horizontal work level.
  2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
  4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
  1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  2. Allow for building movement, including thermal expansion and contraction.
  3. Coordinate installation of anchorages. 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.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.06 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.07 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

### 3.08 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

### 3.09 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

## SECTION 017310 – CUTTING AND PATCHING

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
  - 1. Divisions 2 through 26 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

#### 1.03 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

#### 1.04 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:
  - 1. Water, moisture, or vapor barriers.
  - 2. Membranes and flashings.
  - 3. Equipment supports.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
  - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

### 3.03 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Concrete/Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  3. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
  4. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  3. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017310



## SECTION 017419 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
  - 1. Disposing of nonhazardous demolition and construction waste.

#### 1.02 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

#### 1.03 SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three (3) copies of report. Include separate reports for demolition and construction waste. Include the following information:
  - 1. Material category.
  - 2. Generation point of waste.
  - 3. Total quantity of waste in tons.
  - 4. Quantity of waste salvaged, both estimated and actual in tons.
  - 5. Quantity of waste recycled, both estimated and actual in tons.
  - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
  - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

- B. Waste Reduction Calculations: Before request for Substantial Completion, submit three (3) copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. 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 and address of technician and date refrigerant was recovered.

#### 1.04 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Waste Management Conference: Conduct conference at Project site.

#### 1.05 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification and waste reduction work plan.[ Include separate sections in plan for demolition and construction waste.] Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
  - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
  - 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
  - 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone

numbers.

4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Forms: Prepare waste management plan on forms included at end of Part 3.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.01 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by Architect and Construction Manager. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
  1. Distribute waste management plan to everyone concerned within five (5) days of submittal return.
  2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

### 3.02 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work:

1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers.
  3. Store items in a secure area until installation.
  4. Protect items from damage during transport and storage.
  5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.
- C. Salvaged Items for Owner's Use:
1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers.
  3. Store items in a secure area until delivery to Owner.
  4. Protect items from damage during transport and storage.

### 3.03 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall be shared equally by Owner and Contractor.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.
  2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
  4. Store components off the ground and protect from the weather.
  5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

### 3.04 RECYCLING DEMOLITION WASTE

- A. Asphaltic Concrete Paving: Grind asphalt to maximum 1-1/2-inch size.

- B. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.
- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
  - 1. Pulverize concrete to maximum 1-1/2-inch size.
- D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
  - 1. Pulverize masonry to maximum 3/4-inch size.
  - 2. Clean and stack undamaged, whole masonry units on wood pallets.
- E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- F. Metals: Separate metals by type.
  - 1. Structural Steel: Stack members according to size, type of member, and length.
  - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- H. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
  - 1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.
- J. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
  - 1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- K. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- L. Plumbing Fixtures: Separate by type and size.
- M. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- N. Lighting Fixtures: Separate lamps by type and protect from breakage.
- O. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
- P. Conduit: Reduce conduit to straight lengths and store by type and size.

### 3.05 RECYCLING CONSTRUCTION WASTE

#### A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

#### B. Site-Clearing Wastes: Chip brush, branches, and trees at landfill facility.

#### C. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

#### D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

### 3.06 DISPOSAL OF WASTE

#### A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

#### B. Burning: Do not burn waste materials.

#### C. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

#### D. Disposal: Transport waste materials and dispose of at designated spoil areas on Owner's property.

#### E. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 01 74 23 – CLEANING UP

**PART 1 - GENERAL**

1.1 DESCRIPTION OF THE WORK:

A. The work of this section relates to the following:

1. Maintain all premises and public properties/roadways free from accumulations of waste, debris, dirt, mud and rubbish caused by operations on a daily basis.
2. At completion of work, remove waste materials, rubbish tools, equipment, machinery and surplus materials, and clean all sight exposed surfaces; leave project clean and ready for occupancy.
3. Remove any overspray caused by construction operations from adjacent construction, surfaces.

B. Related Requirements Specified Elsewhere

1. Summary of work: Section 011000
2. Cleaning for Specific Products or Work: the respective sections of the specifications:

1.2 SAFETY REQUIREMENTS

A. Standards: Maintain project in accord with safety and insurance standards.

B. Hazard Control/Cleaning Products

1. Store volatile waste in covered metal containers and remove from premises daily.
2. Provide adequate ventilation during use of volatile or noxious substances.

C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on project site.
2. Do not dispose of volatile waste such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
3. Do not dispose of waste into streams or waterways.

**PART 2 - PRODUCTS**

2.1 Materials: Use only cleaning materials recommended by manufacturer of surface to be cleaned.

**PART 3 - EXECUTION**

3.1 REQUIREMENTS DURING CONSTRUCTION:

- A. Execute daily cleaning to ensure that building, grounds, and public properties and roadways are maintained free from accumulations of waste materials, rubbish, dirt, mud and dust.

## SECTION 01 74 23 – CLEANING UP

- B. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
- C. Each day, all contractors shall adhere to the following:
  - 1. Areas of intense activity, such as cutting and sawing must be swept clean and reorganized at the end of each day. Utilize dust control methods such as plastic containment, containment hut and/or wetting of surfaces.
  - 2. Areas of moderate activity such as installation of plumbing, ductwork, electrical work must be returned to good order at the end of each day.
  - 3. Debris below scaffolds (and shoring/re-shoring) must at all time, be kept sufficiently consolidated to keep walkways free of tripping hazards. These work areas must also be swept clean immediately upon removal of scaffolds.
  - 4. All swept up debris, waste materials, and packing must be removed and placed in the dumpster by the end of the workday.
  - 5. All stored material must be protected and kept in good order.
  - 6. As portions of the work are completed, all used and excess materials must be removed promptly.
  - 7. Daily Clean-up and good housekeeping is the responsibility of each contractor individually and will be monitored by the Construction Manager. If any contractor fails to perform cleaning when directed or does not properly clean within 4 hours of being notified by Construction Manager, the owner will hire others and charge contractor(s) accordingly.
  - 8. Contractors shall promptly comply with requests to organize scattered materials.
- D. **Each Contractor** is responsible for furnishing all dumpsters or other such containers as required for collection, storage and legal disposal of all debris and rubbish resultant from their construction operations. The Construction Manager shall locate and request to move such containers as necessary and legally dispose of waste as containers are filled. Separate and recycle as required authorities and regulations.
- E. Vacuum clean areas when ready to receive finish painting, and continue vacuum cleaning on an as needed basis until building is ready for Substantial Completion or occupancy.
- F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.
- G. Schedule cleaning operations so that dust and other containment resulting from cleaning process will not fall on wet, newly painted surfaces.

### 3.2 FINAL CLEANING

- A. Each Contractor Shall:
  - 1. Employ professional cleaners for final cleaning.
  - 2. In preparation for substantial completion or occupancy, conduct final inspection of sight exposed interior and exterior surfaces, and of concealed spaces.

SECTION 01 74 23 – CLEANING UP

3. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces; polish surface so designated to shine finish.
  4. Maintain cleaning until project, or portion thereof, is occupied by owner.
  5. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
  6. If the contractor fails to perform final cleaning when directed or does not properly clean within 4 hours of being notified by Construction Manager, the owner will hire others and charge contractor accordingly.
- B. **General Contractor:** shall complete the following restoration operations before requesting inspection for certification of Substantial Completion for entire Project or portion of Project:
1. Restoration of any lawn and walk/curb areas disturbed by construction operations. This includes repairs of any ruts / damage created by Heavy equipment, Lulls, cranes, etc.
  2. Magnet sweeping of all exterior lawn areas to ensure that no stray nails / screws, etc. remain in lawn areas.
  3. Hire professional cleaning company (not construction tradesmen) to thoroughly clean all surfaces, including glass, floors, doors, windows, casework, etc.
  4. Final Clean floors using the exact same products / coats as the owner's custodial staff for compatibility purposes. Vacuum all carpet areas
  5. Power sweep all asphalt areas using a commercial street sweeper (water method)
  6. Remove any stickers, protective coverings, etc.
  7. Clean all casework, equipment etc. inside and out.
- C. **Mechanical Contractor:** shall complete the following cleaning operations before requesting final inspection for certification of Substantial Completion for entire project or portion of project.
1. Clean all Mechanical units, including removal of any stickers, protective covering. Wipe down of all unit surfaces for clean streak free surfaces
  2. Vacuum out all ductwork, grills / louvers to insure there is no construction debris or dust
  3. Replace all air filters at no additional cost immediately prior to owner occupancy
  4. Restoration of any lawn and walk/curb areas disturbed by construction operations. This includes repairs of any ruts / damage created by Heavy equipment, Lulls, cranes, etc.
- D. **Electrical Contractor:** shall complete the following cleaning operations before requesting final inspection for certification of Substantial Completion for entire project or portion of project.
1. Clean surfaces of all electrical equipment from any dust. Remove any labels or protective films
  2. Replace any burned out or non-functioning bulbs

SECTION 01 74 23 – CLEANING UP

E. **Plumbing Contractor**: shall complete the following cleaning operations before requesting final inspection for certification of Substantial Completion for entire project or portion of project.

1. Remove any stickers, protective coverings, etc.
2. Clean all drains and plumbing fixtures inside and out.

3.3 RUBBISH REMOVAL

A. Contractors shall comply with all Local, State and Federal Laws, Codes and Requirements regarding recycling and trash or rubbish removal.

END OF SECTION

## SECTION 017700 – CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Refer to Article 15 of the General Conditions for additional requirements.

#### 1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Inspection procedures.
  - 2. Warranties.
  - 3. Final cleaning.
- B. Related Sections include the following:
  - 1. Division 1 Section "Photographic Documentation" for submitting Final Completion construction photographs and negatives.
  - 2. Divisions 2 through 26 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

#### 1.03 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
  - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  - 2. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 4. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  - 5. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

6. Complete final cleaning requirements, including touchup painting.
  7. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  2. Results of completed inspection will form the basis of requirements for Final Completion.

#### 1.04 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment.
  2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.05 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  2. Include the following information at the top of each page:

- a. Project name.
- b. Date.
- c. Name of Architect.
- d. Name of Contractor.
- e. Page number.

## 1.06 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Final Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
  1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
  2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## PART 3 - EXECUTION

### 3.01 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - g. Remove labels that are not permanent.
    - h. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
      - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

## SECTION 01 77 01 – CLOSEOUT CHECKLIST

### PART 1 – GENERAL

#### 1.1 SUBMITTALS

- a. Submit the following documents to the Architect/Engineer before Substantial Completion:
  - Project Record Documents as specified in Section 017839.
  - Operations and Maintenance Manuals prepared in accordance with Section 017823 and be updated as a result of start-up activities.
  - Manufacturer's Start-up Reports (MSR's) for all equipment and systems where manufacturer field time is specified.
    - a. Each MSR shall be signed by the field technician(s) who attended the start-up.
    - b. If the manufacturer is taking exception to the installation or if the warranty is voided, he shall provide a statement to that effect and provide reasons and justification to explain the company's position.
  - 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.
  - Spare parts checklist itemizing all spare parts furnished under the Contract summarized by Section.
  - 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:
  - Final Application for Payment and continuation (G702 and G732)
  - Contractor's Certified Payrolls
  - OSHA cards for all workers
  - Contractor's Affidavit of Payment of Debts and Claims (G706)
  - Contractor's Affidavit of Release of Liens (G706A)
  - Final list of Subcontractors (G705)
  - Subcontractor's Affidavit of Payment of Debts and Claims (G706) – (for each subcontractor used)
  - Subcontractor's Affidavit of Release of Liens (G706A) – (for each subcontractor used)
  - Consent of Surety to Final Payment (G707)
  - 2 Year Maintenance Bond – 100% of contract including change orders
  - Contractors letter guaranteeing workmanship 2 years
  - Product data, Maintenance manuals and Warranty information
  - As Built Documentation – 1 Electronic Copy & 1 Full-size Copy
  - Attic Stock/Spare Parts (provide proof of delivery transmittal signed by owner)
  - Training and Demonstrations (provide sign-in from training session and electronic copy)
  - 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.

**Retainage reduction will not be considered until all items indicated on the above checklist are received in accordance with Section 017700 – Closeout Procedures.**

**END OF SECTION**



## SECTION 017823 – OPERATION AND MAINTENANCE DATA

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
1. Operation and maintenance documentation directory.
  2. Emergency manuals.
  3. Operation manuals for systems, subsystems, and equipment.
  4. Product maintenance manuals.
  5. Systems and equipment maintenance manuals.

#### 1.02 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
  2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
    - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    - b. Enable inserted reviewer comments on draft submittals.
  2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.
- C. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

## PART 2 - PRODUCTS

### 2.01 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.
- B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  - 1. Title page.
  - 2. Table of contents.
  - 3. Manual contents.
- C. Title Page: Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.
  - 3. Name and address of Owner.
  - 4. Date of submittal.
  - 5. Name and contact information for Contractor.
  - 6. Name and contact information for Construction Manager.
  - 7. Name and contact information for Architect.
  - 8. Name and contact information for Commissioning Authority.
  - 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  - 10. Cross-reference to related systems in other operation and maintenance manuals.
- D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
  - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
  2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
  3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
  4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 2.02 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
  2. Flood.

3. Gas leak.
  4. Water leak.
  5. Power failure.
  6. Water outage.
  7. System, subsystem, or equipment failure.
  8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
  2. Shutdown instructions for each type of emergency.
  3. Operating instructions for conditions outside normal operating limits.
  4. Required sequences for electric or electronic systems.
  5. Special operating instructions and procedures.

## 2.03 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  2. Performance and design criteria if Contractor is delegated design responsibility.
  3. Operating standards.
  4. Operating procedures.
  5. Operating logs.
  6. Wiring diagrams.
  7. Control diagrams.
  8. Piped system diagrams.
  9. Precautions against improper use.
  10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.

2. Manufacturer's name.
  3. Equipment identification with serial number of each component.
  4. Equipment function.
  5. Operating characteristics.
  6. Limiting conditions.
  7. Performance curves.
  8. Engineering data and tests.
  9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
  2. Equipment or system break-in procedures.
  3. Routine and normal operating instructions.
  4. Regulation and control procedures.
  5. Instructions on stopping.
  6. Normal shutdown instructions.
  7. Seasonal and weekend operating instructions.
  8. Required sequences for electric or electronic systems.
  9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

## 2.04 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
  1. Product name and model number.

2. Manufacturer's name.
  3. Color, pattern, and texture.
  4. Material and chemical composition.
  5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
  2. Types of cleaning agents to be used and methods of cleaning.
  3. List of cleaning agents and methods of cleaning detrimental to product.
  4. Schedule for routine cleaning and maintenance.
  5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

## 2.05 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins.
  2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  3. Identification and nomenclature of parts and components.
  4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.

2. Troubleshooting guide.
  3. Precautions against improper maintenance.
  4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  5. Aligning, adjusting, and checking instructions.
  6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
  - G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
  - H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

## PART 3 - EXECUTION

### 3.01 MANUAL PREPARATION

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
  1. Do not use original project record documents as part of operation and maintenance manuals.

- F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

## SECTION 017839 – PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.
- B. Related Sections include the following:
  - 1. Division 1 Section "Multiple Contracts Summary" for coordinating Project Record Documents covering the Work of multiple contracts.
  - 2. Division 1 Section "Closeout Procedures" for general closeout procedures.
  - 3. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 4. Divisions 2 through 26 Sections for specific requirements for Project Record Documents of the Work in those Sections.

#### 1.03 SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one (1) set(s) of marked-up Record Prints.
  - 2. Number of Copies: Submit copies of Record Drawings as follows:
    - a. Final Submittal: Submit one (1) set(s) of marked-up Record Prints, one (1) set(s) of Record Transparencies, and four (4) copies printed from Record Transparencies. Print each Drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit one copy (1) of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit five (5) copies of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

## PART 2 - PRODUCTS

### 2.01 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
  1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an understandable drawing technique.
    - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
  2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.
  3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
  4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

- B. Record Transparencies: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected transparencies of the Contract Drawings and Shop Drawings.
1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
  2. Refer instances of uncertainty to Architect for resolution.
  3. Owner will furnish Contractor one set of transparencies of the Contract Drawings for use in recording information.
  4. Print the Contract Drawings and Shop Drawings for use as Record Transparencies. Architect will make the Contract Drawings available to Contractor's print shop.
- C. Record CAD Drawings: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected CAD Drawings of the Contract Drawings, as follows:
1. Format: Same CAD program, version, and operating system as the original Contract Drawings.
  2. Format: DWG Version, operating in Microsoft Windows operating system.
  3. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
  4. Refer instances of uncertainty to Architect for resolution.
  5. Architect will furnish Contractor one set of CAD Drawings of the Contract Drawings for use in recording information.
    - a. Architect makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Contract Drawings.
- D. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
  2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- E. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps.

Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.

3. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
4. Identification: As follows:
  - a. Project name.
  - b. Date.
  - c. Designation "PROJECT RECORD DRAWINGS."
  - d. Name of Architect.
  - e. Name of Contractor.

## 2.02 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
  5. Note related Change Orders and Record Drawings where applicable.

## 2.03 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  3. Note related Change Orders and Record Drawings where applicable.

## 2.04 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

## PART 3 - EXECUTION

### 3.01 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's and DPMC Representative reference during normal working hours.

END OF SECTION 017839



## SECTION 019113 – GENERAL COMMISSIONING REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. OPR and BoD documentation prepared by Owner and Architect contains requirements that apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes general requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.
- B. Related Sections include the following:
  - 1. Division 23 for specific requirements for commissioning HVAC systems.

#### 1.3 DEFINITIONS

- A. BoD: Basis of Design.
- B. CxA: Commissioning Authority.
- C. OPR: Owner's Project Requirements.
- D. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.
- E. TAB: Testing, Adjusting, and Balancing.

#### 1.4 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the Engineer/Architect/Project Management Firm.
- B. Members Appointed by Owner:
  - 1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. In this project, Architect/Engineer/Project Management Firm will oversee the commissioning process.

2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

#### 1.5 OWNER'S RESPONSIBILITIES

- A. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:
  1. Coordination meetings.
  2. Training in operation and maintenance of systems, subsystems, and equipment.
  3. Testing meetings.
  4. Demonstration of operation of systems, subsystems, and equipment.
- B. Provide utility services required for the commissioning process.
- C. Provide the BoD documents, prepared by Architect and approved by Owner, to each Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

#### 1.6 CONTRACTOR'S RESPONSIBILITIES

- A. Provide utility services required for the commissioning process.
- B. Each Contractor shall assign representatives with expertise and authority to act on behalf of the Contractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
  1. Participate in construction-phase coordination meetings.
  2. Participate in maintenance orientation and inspection.
  3. Participate in operation and maintenance training sessions.
  4. Participate in final review at acceptance meeting.
  5. Certify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
  6. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
  7. Review and approve final commissioning documentation.
- C. Subcontractors shall assign representatives with expertise and authority to act on behalf of subcontractors and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
  1. Participate in construction-phase coordination meetings.
  2. Participate in maintenance orientation and inspection.

3. Participate in procedures meeting for testing.
4. Participate in final review at acceptance meeting.
5. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to Architect/Engineer/Project Management Firm for incorporation into the commissioning plan. Update schedule on a weekly basis (or as agreed) throughout the construction period.
6. Provide information to the Architect/Engineer/Project Management Firm for developing construction-phase commissioning plan.
7. Participate in training sessions for Owner's operation and maintenance personnel.
8. Gather and submit operation and maintenance data for systems, subsystems, and equipment to the Architect/Engineer/Project Management Firm, as specified in Division 1 Section "Operation and Maintenance Data."
9. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test procedures and participate in testing of installed systems, subsystems, and equipment.
10. The contractor will be responsible for paying an independent testing agency to conduct commissioning. Two (2) copies of the final report must be submitted, one (1) to the engineer of record and one (1) to the owner.

#### 1.7 ARCHITECT/ENGINEER/PROJECT MANAGEMENT FIRM RESPONSIBILITIES

- A. Organize and lead the commissioning team.
- B. Review and comment on submittals from each Contractor for compliance with the OPR, BoD, Contract Documents, and construction-phase commissioning plan. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the OPR and BoD.
- C. At the beginning of the construction phase, conduct an initial construction-phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for operation and maintenance submittals; operation and maintenance training sessions; TAB Work; and Project completion.
- D. Observe and inspect construction and report progress and deficiencies. In addition to compliance with the OPR, BoD, and Contract Documents, inspect systems and equipment installation for adequate accessibility for maintenance and component replacement or repair.
- E. Prepare Project-specific test and inspection procedures and checklists.
- F. Schedule, direct, witness, and document tests, inspections, and systems startup.
- G. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning report.
- H. Certify date of acceptance and startup for each item of equipment for start of warranty periods.

- I. Review Project Record Documents for accuracy. Request revisions from Contractor to achieve accuracy. Project Record Documents requirements are specified in Division 1 Section "Project Record Documents."
- J. Review and comment on operation and maintenance documentation and systems manual outline for compliance with the OPR, BoD, and Contract Documents. Operation and maintenance documentation requirements are specified in Division 1 Section "Operation and Maintenance Data."
- K. Prepare operation and maintenance training program. Operation and maintenance training is specified in Division 23.

## 1.8 QUALITY ASSURANCE

- A. Instructor Qualifications: Factory-authorized service representatives, experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.
- B. Test Equipment Calibration: Comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

- A. Training Preparation Conference: Before operation and maintenance training, Architect/Engineer/Project Management Firm shall convene a training preparation conference to include Owner's operation and maintenance personnel, Contractor, and subcontractors. In addition to requirements specified in Division 23 perform the following:
  - 1. Review the BoD.
  - 2. Review installed systems, subsystems, and equipment.
  - 3. Review instructor qualifications.
  - 4. Review instructional methods and procedures.
  - 5. Review training module outlines and contents.
  - 6. Review course materials (including operation and maintenance manuals).
  - 7. Inspect and discuss locations and other facilities required for instruction.
  - 8. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.

9. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.
- B. Training Modules: Develop an instruction program that includes individual training modules for each system, subsystem, and equipment as specified in Division 23.

END OF SECTION 019113



## SECTION 024119 – SELECTIVE DEMOLITION

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Removal and demolition of selected items from selected areas of the building as indicated on the drawings.
- B. Related Sections include the following:
  - 1. Division 1 Section "Summary of Work" for use of premises, and phasing, and Owner-occupancy requirements.
  - 2. Division 1 Section "Photographic Documentation" for preconstruction photographs taken before selective demolition operations.
  - 3. Division 1 Section "Construction Waste Management" for disposal of demolished materials.
  - 4. Division 1 Section "Cutting and Patching" for cutting and patching procedures.

#### 1.03 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated to provide a full and complete system.

#### 1.04 SUBMITTALS

- A. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations. Comply with Division 1 Section "Photographic Documentation." Submit before Work begins.

#### 1.05 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI A10.6 and NFPA 241.
- D. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
  - 1. Inspect and discuss condition of construction to be selectively demolished.
  - 2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
  - 4. Review areas where existing construction is to remain and requires protection.

#### 1.06 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
  - 1. Comply with requirements specified in Division 1 Section "Summary of Work."
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is unknown whether hazardous materials will be encountered in the Work.
  - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Contractor shall be required to remove and dispose of lead paint if encountered as specified in Section 1.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations. Contractor is responsible to call for markouts prior to demolition activities. Coordinate with installation of all new building services in accordance with the drawings and specifications.

#### PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- B. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
  - 1. Comply with requirements specified in Division 1 Section "Photographic Documentation."
- E. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

### 3.02 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
  - 3. Cover and protect equipment that have not been removed.

### 3.03 SELECTIVE DEMOLITION, GENERAL

- A. Removed and Reinstalled Items:
  - 1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
  - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  - 3. Protect items from damage during transport and storage.
  - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

### 3.04 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
  - 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. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

### 3.05 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

**SECTION 02 8200 – ASBESTOS ABATEMENT**

AT: MOUNT PLEASANT CENTRAL SCHOOL DISTRICT  
WESTLAKE HIGH SCHOOL  
SED# 66-08-01-06-0-005-020

OWNER: MOUNT PLEASANT CENTRAL SCHOOL DISTRICT  
825 WESTLAKE DRIVE  
THORNWOOD, NEW YORK 10594

CONSULTANT: QUALITY ENVIRONMENTAL SOLUTIONS  
& TECHNOLOGIES, INC.  
1376 ROUTE 9  
WAPPINGERS FALLS, NEW YORK 12590



**SPECIFICATION DATED: April 6, 2020**

Design conforms to all applicable provisions of the NYS Uniform Fire Prevention and Building Code, NYS Energy Conservation Construction Code and Education Department Building Standards.

## SECTION 02 8200 – ASBESTOS ABATEMENT PROCEDURES

### PART I – GENERAL

#### 1.01 DESCRIPTION

- A. All work under this contract shall be performed in strict accordance with the specifications and all applicable laws for asbestos removal projects. The Abatement Contractor shall furnish all labor, materials, supervision, services, insurance and equipment necessary for the complete and total removal of Asbestos-containing Materials (ACM) as described herein, in attachments to the specification, Job Specific Variance(s) and/or as directed by Mount Pleasant CSD (here-in-after the "Owner") and/or the Owners Representative(s) to support the *Mount Pleasant CSD – 2020 Physical Education Department Renovations*.
- B. Abatement Contractor shall provide for personnel air monitoring to satisfy OSHA regulation 29 CFR Parts 1926.1101(f). All work performed shall be in strict accordance with applicable provisions and regulations promulgated under New York State Department of Labor, Industrial Code 56 (ICR-56).
- C. The Abatement Contractor shall satisfy the requirements for asbestos projects issued by the New York State Department of Labor concerning licensing and certification; notification; equipment; removal and disposal procedures; engineering controls; work area preparation; decontamination and clean-up procedures; and personnel air monitoring.
- D. The Abatement Contractor shall be responsible for submittal of asbestos project notification(s) and applicable fees to EPA and NYSDOL concerning this project. Project notification(s) shall be made for the cumulative total of ACM to be removed as required by ICR-56-3.4. Work practices for each individual work area established shall be consistent with the quantity of ACM contained within that work area as defined in ICR-56-2.
- E. The scope of work under this contract shall include the following:
  1. All asbestos-containing materials (ACM) shall be removed in accordance with these specifications. The Abatement Contractor is responsible for field verification of estimated quantities, locations and other site conditions that may affect work.
  2. All fixed objects remaining within the work area(s) shall be protected as required by Title 12 NYCRR Section 56-7.10(b) and as described in these specifications.
  3. The containerization, labeling and disposal of all asbestos waste in accordance with applicable city, state and federal regulations and these specifications.
  4. The Abatement Contractor will be responsible for repairing all building components damaged during abatement including, but not limited to, ceiling tiles, ceiling finishes, wall finishes and/or floor finishes, etc.
  5. The Abatement Contractor shall be responsible for any and all demolition required to access materials identified in scope of work and on associated drawings.
  6. Concealed conditions that are exposed and may require additional work shall be brought to the attention of the Owner(s) immediately. The Abatement Contractor shall not abate these

areas without a written notice to proceed. If the Abatement Contractor removes additional asbestos prior to the order to proceed the additional work will not be acknowledged.

7. Permissible working hours shall be Monday through Friday 7:00 A.M. to 4:00 P.M. and/or as defined by the Owner(s) and/or Owner's Representative(s). Holidays shall be considered weekends and not included for working days. Upon written approval from the Owner, the Abatement Contractor may work past these hours. The Abatement Contractor will incur any and all costs associated for work performed beyond the defined schedule including, but not limited to: abatement activities, project/air monitoring, custodial/staffing labor, overtime, mobilizations, etc.
8. Buildings will be turned over to the Abatement Contractor as is. At that time, all electrical services and HVAC systems in the proposed work areas will be shut down. Electricity and water supply will be maintained in the building for use by the Abatement Contractor. The Abatement Contractor is responsible for securing all power in the work area(s) and establishing all temporary GFCI hookups necessary to complete his work.
9. The Abatement Contractor shall remove all identified Asbestos-containing Materials (ACM) to building substrate(s); in areas indicted. Subsequent to final air clearances, the substrate(s) shall be washed with a neutralizing agent to prepare the substrate to accept new floor covering and eliminate residual odors.
10. The Abatement Contractor must coordinate location of waste containers with the Facility and the Owner. Deliveries and storage of equipment must be coordinated with the Facility and the Owner.
11. All "Large" and "Small" asbestos abatement projects, as defined by 12 NYCRR56 shall not be performed while the building is occupied. The term "building" means a wing or major section of a building that can be completely isolated from the rest of the building with sealed non-combustible construction. The isolated portion of the building must contain exists that do not pass through the occupied portion(s) and ventilation systems must be physically separated and sealed at the isolation barriers.

## **1.02 PRE-CONTRACT SUBMITTALS**

Within three (3) days after bids are opened, the three (3) apparent low bidders shall be required to submit the following documentation:

A. Resume's: Shall include the following:

1. Provide a list of projects of similar nature performed within the past two (2) years and include the dollar value of all projects. Provide project references to include owner, consultant, and air monitoring firms' name, contact person, address, and phone number, include location of project and date of completion.
2. Abatement Contractor license issued by New York State Department of Labor for asbestos work in accordance with ICR-56-3.
3. A list of owned equipment available to be used in the performance of the project.
4. The number of years engaged in asbestos removal.

5. An outline of the worker training courses and medical surveillance program conducted by the Abatement Contractor.
6. A standard operating procedures manual describing work practices and procedures, equipment, type of decontamination facilities, respirator program, special removal techniques, etc.
7. Documentation to the satisfaction of the Owner pertaining to the Abatement Contractor's financial resources available to perform the project. Such data shall include, but not be limited to, the firm's balance sheet for the last fiscal year.

**B. Citations/Violations/Legal Proceedings**

1. Submit a notarized statement describing any citations, violations, criminal charges, or legal proceedings undertaken or issued by any law enforcement, regulatory agency, or consultant concerning performance on previous asbestos abatement contracts. Briefly describe the circumstances citing the project and involved persons and agencies as well as the outcome of any actions.
2. Answer the question: "Has your firm or its agents been issued a Stop Work order on any project within the last two years?" If "Yes" provide details as discussed above.
3. Answer the question: "Are you now, or have you been in the past, a party to any litigation or arbitrations arising out of your performance on Asbestos Abatement Contracts?" If "Yes" provide details as discussed in 1. above.
4. Describe any liquidated damages assessed within the last two years.

**C. Preliminary Schedule**

1. Provide a detailed schedule including work dates, work shift times, estimate of manpower to be utilized and the start and completion date for completion of each major work area.

**1.03 DOCUMENTATION**

- A. The Abatement Contractor shall be required to submit the following and receive the Consultant's approval prior to commencing work on this project:
1. Provide documentation of worker training for each person assigned to the project. Documentation shall include copies of each workers valid New York State asbestos handler certificates (for those employees who may perform asbestos removal), documentation of current respirator fit test and current OSHA required training and medical examination.
  2. The attached "Asbestos Employee Medical Examination Statement" and "Asbestos Employee Training Statement" forms shall be completed, signed and submitted for each worker assigned to the project. Records of all employee training and medical surveillance shall be maintained for at least forty (40) years. Copies of the records shall be submitted to the Consultant prior to commencement.

3. The Abatement Contractor shall submit proof of a current, valid license issued by the New York State Department of Labor pursuant to the authority vested in the Commissioner by section 906 of the Labor Laws, and that the employees performing asbestos related work on this project are certified by the State of New York as required in Part 56 of Title 12 of the Official Compilation of Codes, Rules and Regulations of the State of New York latest edition. Copies of all licenses shall be submitted prior to the commencement of the project.
4. The Abatement Contractor shall submit a written respiratory protection program meeting the requirements of 29 CFR 1910.134 to the Consultant.
5. The name, address, social security number and NYS DOL certificate number of the person(s) who will supervise the asbestos project.
6. The name and address of the deposit or waste disposal site or sites where the asbestos materials are to be deposited or disposed of. This site must be approved by the Owner. The manifesting procedure must also be specified.
7. The name, address and New York State Dept. of Environmental Conservation ID Number of any transporters that are to be used to transport waste.
8. A written Standard Operation Procedure (SOP) that is designed and implemented to maximize protection against human exposure to asbestos dust. The SOP shall take into consideration the workers, visitors, building employees, general public and environment. As a minimum the procedures must include the following:
  - a. Security for all work areas on an around-the-clock basis against unauthorized access.
  - b. Project organization chart including the phone numbers of at least two responsible persons who shall be authorized to dispatch men and equipment to the project in the event of an emergency; including weekends.
  - c. Description of protective clothing and NIOSH approved respirators to be used.
  - d. Description of all removal methods to be used, including HEPA air filtration and decontamination sequence with special emphasis on any procedure that may deviate from these specifications.
  - e. A list of manufacturers' certificates stating that all vacuums, negative air filtration equipment, respirators and air supply equipment meet OSHA and EPA requirements.
  - f. A list of all materials proposed to be furnished and used under this contract.
  - g. Emergency evacuation procedures in the event of fire, smoke or accidents such as injury from falling, heat exposure, electrical shock, etc.
  - h. The name, address and ELAP number of the New York State Department of Health Certified Analytical Testing Laboratory the Contractor proposes to use for the OSHA monitoring.
9. A detailed plan, in triplicate, for the phasing of the project, division of work areas and location of decontamination facilities, waste containers and temporary office.

10. Work schedule, identifying firm dates and completion for actual areas. Bar chart or critical path chart indicating phases is required.
- B. The Abatement Contractor shall post their NYS DOL contractor's license and maintain a daily log documenting the dates and time of the following items within each personal decontamination unit:
1. Meetings; purpose, attendants, discussion (brief)
  2. Sign-in and sign-out of all persons entering the work area including name, date, time, social security number, position or function and general description of daily activity.
  3. Testing of barriers and enclosure systems using smoke tubes prior to the beginning of abatement activities and at least once a day thereafter until satisfactory clearance air monitoring results have been achieved.
  4. Inspection of all plastic barriers, twice daily, by the asbestos supervisor.
  5. Loss of enclosure integrity; special or unusual events, barrier breaches, equipment failures, etc.
  6. Daily cleaning of enclosures.
  7. Personnel air monitoring test results for OSHA Compliance. Results shall be posted at the work site within 24 hours of testing and copies supplied to the Owner within five (5) days of testing. Abnormalities shall be supplied to the Owner immediately.
- C. Documentation with confirmation signature of Consultant's representative of the following shall be provided by the Abatement Contractor at the final closeout of the project.
1. Testing of barriers and enclosure systems using smoke tubes shall be performed prior to the beginning of abatement activities and at least once a day thereafter until satisfactory clearance air monitoring results have been achieved.
  2. Inspection of all plastic barriers.
  3. Removal of all polyethylene barriers.
  4. Consultant's inspections prior to encapsulation.
  5. Removal of waste materials.
  6. Decontamination of equipment (list items).
  7. Consultant's final inspection/final air tests.
- D. The Abatement Contractor shall provide records of all project information, to include the following which shall be submitted upon completion of the project and prior to approval of the Abatement Contractor's payment application:
1. The location and description of the abatement project.
  2. The name, address and social security number of the person(s) who supervised the asbestos

project.

3. Certified payroll documentation Pursuant to Article 8, Section 220 of the NYS Labor Law
4. Copies of EPA/NYSDOL Asbestos Certificates for all Workers and Supervisors employed on the Project.
5. Copies of Medical Approval and Respirator Fit-testing for all Asbestos Workers and Supervisors employed on the Project.
6. Copies of Abatement Contractors Daily Sign-In Sheets & Logs for persons entering and leaving the work area. – Title 12 NYCRR Part 56-7.3.
7. Copies of Abatement Contractor’s personal air sampling laboratory results.
8. The amounts and type of asbestos materials that was removed, enclosed, encapsulated, or disturbed.
9. The name and address of the deposit or waste disposal site or sites where the asbestos waste materials were deposited or disposed of and all related manifests, receipts and other documentation associated with the disposal of asbestos waste.
10. The name and address of any transporters used to transport waste and all related manifests, receipts and other documentation associated with the transport of asbestos waste.
11. All other information that may be required by state, federal or local regulations.
12. Copy of the Supervisor’s Daily Project Log of events as described in 1.03 B, above.

#### **1.04 NOTIFICATIONS AND PERMITS**

- A. The Abatement Contractor shall be required to prepare and submit notifications to the following agencies at least ten (10) days and/or business days, as required prior to the commencement of the project:
  1. Asbestos NESHAPS Contact  
U.S. Environmental Protection Agency  
NESHAPS Coordinator, Air Facilities Branch  
26 Federal Plaza  
New York, New York 10007  
(212) 264-7307
  2. State of New York Department of Labor  
Division of Safety and Health  
Asbestos Control Bureau  
State Office Building Campus, Building 12, Room 454  
Albany, New York 12240

3. Owner(s):  
Mount Pleasant CSD  
825 Westlake Drive  
Thornwood, NY 10594  
ATTN: Eric Strack Director of Facilities  
Ph. (914) 769-5500  
Fx. (914) 769-3733  
E-mail. [estrack@mtplcsd.org](mailto:estrack@mtplcsd.org)
4. Environmental Consultant(s): Quality Environmental Solutions & Technologies, Inc. (QuES&T)  
1376 Route 9  
Wappingers Falls, New York 12590  
ATTN: Greg Dean, Manager of Field Services  
Ph. (845) 298-6031  
Fx. (845) 298-6251  
E-mail. [gdean@qualityenv.com](mailto:gdean@qualityenv.com)

B. The notification shall include but not be limited to the following information:

1. Name and address of Owner.
2. Name, address and asbestos handling license number of the Abatement Contractor.
3. Address and description of the building, including size, age, and prior use of the building or area; the amount, in square feet or linear feet of asbestos material to be removed; room designation numbers or other local information where asbestos material is found, including the type of asbestos material (friable or non-friable).
4. Scheduled starting and completion dates for removal.
5. Methods to be employed in abating asbestos containing materials.
6. Procedures and equipment, including ventilating/exhaust systems, that will be employed to comply with the Code of Federal Regulation (CFR) Title 40, Part 61 of the U.S. Environmental Protection Agency.
7. The name and address of the carting company and of the waste disposal site where the asbestos waste will be deposited.

**NOTE:** Notifications shall be submitted using standard forms as may be used by the respective agency.

For DOL (NYS) include "Asbestos Project Notification" form (DOSH-483) with proper fee, if required. For EPA include "Notification of Demolition and Renovation"; 40 CFR Part 61.

- C. The Abatement Contractor shall secure any permits required by the city, town, county, or state that may be required and the cost for obtaining the permit shall be included in his base bid.
- D. The Abatement Contractor shall erect warning signs around the work space at every point of potential entry into the work area in accordance with OSHA 1926.58k (2), (i). These signs shall bear the following information:

E.

**DANGER**  
**CANCER AND LUNG DISEASE HAZARD**  
**AUTHORIZED PERSONNEL ONLY**  
**RESPIRATORS AND PROTECTIVE**  
**CLOTHING**  
**ARE REQUIRED IN THIS AREA**

- F. The Abatement Contractor shall post at entrances to the work place and immediate adjacent areas, notifications to building occupants which include the name and license number of the contractor, project location and size, amount and type of ACM, abatement procedures, dates of expected occurrence and name and address of the air monitor and laboratory in compliance with ICR 56-3.6.
- G. The Abatement Contractor shall post a list of emergency telephone numbers at the job site which shall include the Owner's Representative, police, emergency squad, local hospital, Environmental Protection Agency, N.Y. State Department of Labor, Occupational Safety and Health Administration and the local Department of Health.

#### **1.05 APPLICABLE STANDARDS**

Except to the extent that more explicit or more stringent requirements are written directly into the contract documents, applicable standards of the construction industry have the same force and effects (and are made a part of contract documents by reference) as if copied directly into contract documents, or as if published copies were bound herewith. Resolution of overlapping and conflicting requirements, which result from the application of several different industry standards to the same unit of work, shall be by adherence to the most stringent requirement.

- A. Applicable standards listed in these Specifications form a part of this Specification and include, but are not necessarily limited to, standards promulgated by the following agencies and organizations:
1. ANSI:  
American National Standards Institute  
1430 Broadway  
New York, New York 10018
  2. ASHRAE:  
American Society for Heating, Refrigerating  
and Air Conditioning Engineers  
1791 Tullie Circle NE  
Atlanta, Georgia 30329
  3. ASTM:  
American Society for Testing and Materials  
1916 Race Street  
Philadelphia, Pennsylvania 19103

4. CFR  
Code of Federal Regulations Available  
from Government Printing Office  
Washington, District of Columbia 20402
5. CGA  
Compressed Gas Association  
1235 Jefferson Davis Highway  
Arlington, Virginia 22202
6. CS  
Commercial Standard of NBS  
(US Dept. of Commerce)  
Government Printing Office
7. EPA  
Environmental Protection Agency, Region II  
26 Federal Plaza  
New York, New York 10007  
Asbestos Coordinator - Room 802  
(212) 264-9538  
Part 61, Sub-Parts A & B  
National Emission Standard for Asbestos
8. FEDERAL SPECS  
Federal Specification (General Services Administration)  
7th and D Street, SW  
Washington, District of Columbia 20406
9. NBS  
National Bureau of Standards  
(US Department of Commerce)  
Gaithersburg, Maryland 20234
10. NEC  
National Electrical Code (by NFPA)
11. NFPA  
National Fire Protection Association  
Batterymarch Park  
Quincy, Massachusetts 02269
12. NIOSH  
National Institute for Occupational Safety and Health  
26 Federal Plaza  
New York, New York 10007

13. NYSDOH

New York State Department of Health  
Bureau of Toxic Substance Assessment  
Room 359 - 3rd Floor  
Tower Building Empire State Plaza  
Albany, New York 12237

14. NYSDEC

New York State Department of Environmental Conservation  
Room 136  
50 Wolf Road  
Albany, New York 12233-3245

15. NYSDOL

State of New York Department of Labor  
Division of Safety and Health  
Asbestos Control Program  
State Campus  
Building 12  
Albany, New York 12240

16. OSHA

Occupational Safety and Health Administration  
(US Department of Labor)  
New York Regional Office - room 3445  
1515 Broadway  
New York, New York 10036

17. UL

Underwriters Laboratories  
333 Pfingsten Road  
Northbrook, Illinois 60062

B. Federal Regulations: Those which govern asbestos abatement work or hauling and disposal of asbestos waste materials:

1. U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA):

- a. Asbestos Regulations  
Title 29, Part 1910, of the Code of Federal Regulations.
- b. Respiratory Protection  
Title 29, Part 1910, Section 134 of the Code of Federal Regulations.
- c. Construction Industry  
Title 29, Part 1926, of the Code of Federal Regulations.
- d. Access to Employee Exposure & Medical Records  
Title 29, Part 1910, Section 20 of the Code of Federal Regulations.
- e. Hazard Communication

Title 29, Part 1910, Section 1200 of the Code of Federal Regulations.

- f. Specifications for Accident Prevention Signs and Tags  
Title 29, Part 1910, section 145 of the Code of Federal Regulations.

2. U.S. Environmental Protection Agency (EPA):

- a. Asbestos Hazard Emergency Response Act (AHERA) Regulation Asbestos Containing Materials in Schools Final Rule & Notice Title 40, Part 763, Subpart E of the Code of Federal Regulations.
- b. Worker Protection Rule  
40 CFR Part 763, Subpart G, CPTS 62044, FLR 2843-9  
Federal Register, Vol. 50, No. 134, 7/12/85, P28530-28540
- c. Regulation for Asbestos  
Title 40, Part 61, Subpart A of the Code of Federal Regulations
- d. National Emission Standard for Asbestos  
Title 40, Part 61, Subpart M (Revised Subpart B) of the Code of Federal Regulations
- e. Resource Conservation and Recovery Act (RCRA) 1976, 1980  
Hazardous and Solid Waste Amendments (HSWA) 1984  
Subtitle D, Subtitle C

3. U.S. Department of Transportation (DOT):

- a. Hazardous Substances: Final Rule Regulation 49 CFR, Part 171 and 172.

C. State Regulations: Those which govern asbestos abatement work or hauling and disposal of asbestos waste materials:

- 1. New York State Department of Environmental Conservation (DEC) Regulations regarding waste collection registration. Title 6, Part 364 of the New York State Official Compilation of Codes, Rules and Regulations - 6NYCRR 364.
- 2. New York State Right-To-Know Law
- 3. New York State Department of Labor Asbestos Regulations Industrial Code Rule 56.
- 4. New York State Department of Health, Title 10 Part 73 Asbestos Safety Program Requirements.

D. Standards: Those which govern asbestos abatement work or hauling and disposal of asbestos waste materials:

- 1. American National Standards Institute (ANSI)
  - a. Fundamentals Governing the Design and Operation of Local Exhaust Systems  
Publication Z9.2-79
  - b. Practices for Respiratory Protection  
Publication Z88.2-80

- E. Guidance Documents: Those that discuss asbestos abatement work or hauling and disposal of asbestos waste materials are listed below only for the Abatement Contractor's information. These documents do not describe the work and are not a part of the work of this contract.

EPA:

1. Guidance for Controlling Asbestos Containing Materials in Buildings (Purple Book) EPA560/5-85-024.
2. Asbestos Waste Management Guidance EPA 530-SW-85-007.

- F. Patents and Royalties: The Abatement Contractor shall pay all royalties and/or license fees. The Abatement Contractor shall defend all suits and claims for infringement of any patent rights and save the Owner and Consultant harmless from loss including attorney fees on account thereof.

## 1.06 DEFINITIONS

As used in or in connection with these specifications the following are terms and definitions.

**Abatement** - Procedure to control release from asbestos material. This includes removal, encapsulation and enclosure.

**Aggressive sampling** - A method of sampling in which the person collecting the air sample creates activity by the use of mechanical equipment during the sampling period to stir up settled dust and simulate activity in that area of the building.

**AIHA** - The American Industrial Hygiene Association, 475 Wolf Ledges Parkway, Akron, Ohio 44311.

**Airlock** - A system for permitting entrance and exit while restricting air movement between a containment area and an uncontaminated area. It consists of two curtained doorways separated by a distance of at least three feet such that one passes through one doorway into the airlock, allowing the doorway sheeting to overlap and close off the opening before proceeding through the second doorway, thereby preventing flow-through contamination.

**Air sampling** - The process of measuring the content of a known volume of air collected during a specific period of time.

**Amended water** - Water to which a surfactant has been added.

**Approved asbestos safety program** - A program approved by the Commissioner of Health providing training in the various disciplines that may be involved in an asbestos project.

**Area air sampling** - Any form of air sampling or monitoring where the sampling device is placed at some stationary location.

**Asbestos** - Any naturally occurring hydrated mineral silicate separable into commercially usable fibers, including chrysotile (serpentine), amosite (cumingtonite-gunerite), crocidolite (riebeckite), tremolite, anthophyllite and actinolite.

**Asbestos contract** - An oral or written agreement contained in one or more documents for the performance of work on an asbestos project and includes all labor, goods and service.

**Asbestos handler** - An individual who installs, removes, applies, encapsulates, or encloses asbestos or asbestos material, or who disturbs friable asbestos. Only individuals certified by NYS Department of Labor shall be acceptable for work under this specification.

**Asbestos handling certificate** - A certificate issued by the Commissioner of Labor of the State of New York, to a person who has satisfactorily completed an approved asbestos safety program.

**Asbestos project** - Work undertaken by a contractor which involves the installation, removal, encapsulation, application or enclosure of any ACM or the disturbance of friable ACM.

**Asbestos Safety Technician (AST)** - Individual designated to represent the Consultant, perform third party monitoring and perform compliance monitoring at the job site during the asbestos project.

**Asbestos waste material** - Asbestos material or asbestos contaminated objects requiring disposal.

**Authorized visitor** - The building owner, his or her representative or any representative of a regulatory or other agency having jurisdiction over the project.

**Background level monitoring** - A method used to determine ambient airborne concentrations inside and outside of a building or structure prior to starting an abatement project.

**Building owner** - The person in whom legal title to the premises is vested unless the premises are held in land trust, in which instance Building Owner means the person in whom beneficial title is vested.

**Clean room** - An uncontaminated area or room that is a part of the personal decontamination enclosure with provisions for storage of persons' street clothes and protective equipment.

**Cleanup** - The utilization of HEPA vacuuming to control and eliminate accumulations of asbestos material and asbestos waste material.

**Clearance air monitoring** - The employment of aggressive sampling techniques with a volume of air collected to determine the airborne concentration of residual fibers upon conclusion of an asbestos abatement project.

**Commissioner** - Commissioner of the New York State Department of Labor.

**Contractor** - A company, unincorporated association, firm, partnership or corporation and any owner or operator thereof, which engages in an asbestos project or employs persons engaged in an asbestos project.

**Curtained doorway** - A device that consists of at least three overlapping sheets of plastic over an existing or temporarily framed doorway. One sheet shall be secured at the top and left side, the second sheet at the top and right side, and the third sheet at the top and the left side. All sheets shall have weights attached to the bottom to insure that the sheets hang straight and maintain a seal over the doorway when not in use.

**Decontamination enclosure system** - A series of connected rooms, separated from the work area and from each other by air locks, for the decontamination of persons, materials, equipment, and authorized visitors.

**Encapsulant (sealant) or encapsulating agent** - A liquid material that can be applied to asbestos material and which prevents the release of asbestos from the material by creating a membrane over the surface.

**Enclosure** - The construction of airtight walls, ceilings and floors between the asbestos material and the facility environment, or around surfaces coated with asbestos materials, or any other appropriate procedure that prevents the release of asbestos materials.

**Equipment room** - A contaminated area or room that is part of the personal decontamination enclosure system with provisions for the storage of contaminated clothing and equipment.

**Fixed object** - A unit of equipment, furniture or other fixture in the work area which cannot be readily removed from the work area.

**Friable Asbestos Material** - That condition of crumbled, pulverized, powdered, crushed or exposed asbestos capable of being released into the air by hand pressure.

**Friable material containment** - The encapsulation or enclosure of any friable asbestos material.

**Glovebag technique** - A method for removing asbestos material from heating, ventilating, and air conditioning (HVAC) ducts, piping runs, valves, joints, elbows, and other nonplanar surfaces in a noncontained work area. The glovebag assembly is a manufactured device consisting of a glovebag constructed of at least six mil transparent plastic, two inward-projecting longsleeve gloves, which may contain an inward projecting waterwand sleeve, an internal tool pouch, and an attached, labeled receptacle or portion for asbestos waste. The glovebag is constructed and installed in such a manner that it surrounds the object or area to be decontaminated and to contain all asbestos fibers released during the abatement process.

**HEPA filter** - A high efficiency particulate air filter capable of trapping and retaining 99.97 percent of particulate greater than 0.3 microns equivalent aerodynamic diameter.

**HEPA vacuum equipment** - Vacuuming equipment with a high efficiency particulate air filtration system.

**Holding area** - A chamber in the waste decontamination enclosure located between the washroom and an adjacent uncontaminated area.

**Homogeneous work area** - A site within the abatement work area that contains one type of asbestos material and where one type of abatement is used.

**Large asbestos project** - An asbestos project involving the installation, removal, disturbance, enclosure, or encapsulation of 160 square feet or more of asbestos or asbestos material or 260 linear feet or more of asbestos or asbestos material.

**Minor asbestos project** - An asbestos project involving the installation, removal, disturbance, enclosure, or encapsulation of 10 square feet or less of asbestos or asbestos material, or 25 linear feet or less of asbestos or asbestos material.

**Movable object** - A unit of equipment, furniture or fixture in the work area that can be readily removed from the work area.

**Negative air pressure equipment** - A local exhaust system equipped with HEPA filtration. The system shall be capable of creating and maintaining a negative pressure differential between the outside and the inside of the work area.

**Non-asbestos material** - Any material containing one percent or less asbestos by weight.

**Occupied area** - Any frequented portion of the work site where abatement is not taking place.

**Outside air** - The air outside the building or structure.

**Personal air monitoring** - A method used to determine an individual's exposure to airborne contaminants. The sample is collected outside the respirator in the person's breathing zone.

**Plasticize** - To cover floors, walls, ceilings and other surfaces with 6 mil fire retardant plastic sheeting as herein specified.

**Project** - Any form of work performed in connection with the abatement of asbestos or alteration, renovation, modification or demolition of a building or structure that may disturb asbestos or asbestos material.

**Removal** - The stripping of any asbestos material.

**Repair** - Corrective action using required work practices to control fiber release from damaged areas.

**Respiratory protection** - Respiratory protection required of licensed asbestos workers and authorized visitors in accordance with the applicable laws.

**Satisfactory clearance air monitoring results** - For all post-abatement samples, airborne concentrations of total fibers that are less than 0.01 fibers per cubic centimeter or background levels, whichever are greater, using phase contrast microscopy (PCM).

**Shower room** - A room between the clean room and the equipment room in the personal decontamination enclosure with hot and cold running water controllable at the top and arranged for complete showering during decontamination.

**Small asbestos project** - An asbestos project involving the installation, removal, disturbances, enclosure, or encapsulation of more than 10 and less than 160 square feet of asbestos or asbestos material of more than 25 and less than 260 linear feet of asbestos or asbestos material.

**Staging area** - The area near the waste transfer airlock where containerized asbestos waste has been placed prior to removal from the work area.

**Surfactant** - A chemical wetting agent added to water to improve its penetration.

**Visible emissions** - An emissions of particulate material that can be seen without the aid of instruments.

**Washroom** - A room between the work area and the holding area in the waste decontamination enclosure system, where equipment and waste containers are wet cleaned and/or HEPA vacuumed.

**Waste decontamination enclosure system** - An area, consisting of a washroom and a holding area, designated for the controlled transfer of materials and equipment.

**Wet cleaning** - The process of eliminating asbestos contamination from surfaces, equipment or other objects by using cloths, mops, or other cleaning tools.

**Work area** - Designated rooms, spaces, or areas where asbestos abatement takes place.

**Work site** - Premises where asbestos abatement is taking place.

**Work Surface** - Substrate surface from which asbestos-containing material has been removed.

## **1.07 UTILITIES, SERVICE AND TEMPORARY FACILITIES**

- A. The Owner shall make available to the Abatement Contractor all reasonable amounts of water and electrical power at no charge.
- B. The Abatement Contractor shall provide, at his own expense, all electrical, water, and waste connections, extensions, and construction materials, supplies, etc. All connections must be approved in advance by the Owner and all work relative to the utilities must be in accordance with the applicable building codes.
- C. The Abatement Contractor shall provide scaffolding, ladders and staging, etc. as necessary to accomplish the work of this contract. The type, erection and use of all scaffolding, ladders and staging, etc. shall comply with all applicable OSHA provisions.
- D. All connections to the Owner's water system shall include reduced pressure backflow protection or double check and double gate valves. Valves shall be temperature and pressure rated for operation of the temperatures and pressures encountered. After completion of use, connections and fittings shall be removed without damage or alteration to existing water piping and equipment. Leaking or dripping valves shall be piped to the nearest drain or located over an existing sink or grade where water will not damage existing finishes or equipment.
- E. The Abatement Contractor shall use only heavy duty abrasion resistant hoses with a pressure rating greater than the maximum pressure of the water distribution system to provide water to each work area and to each decontamination unit. Provide fittings as required to allow for connection to existing wall hydrants or spouts, as well as temporary water heating equipment, branch piping, showers, shut-off nozzles and equipment. All water must be shut off at the end of each shift.
- F. The Abatement Contractor shall provide service to decontamination unit electrical subpanel with minimum 60 amp, 2 pole circuit breaker or fused disconnect and ground-fault circuit interrupters (GFCI), reset button and pilot light, connected to the building's main distribution panel. Subpanel and disconnect shall be sized and equipped to accommodate all electrical equipment required for completion of the work. This electrical subpanel shall be used for hot water heater, PAPR battery recharging and air sampling pumps.

- G. The Abatement Contractor shall provide UL rated 40-gallon electric hot water heater to supply hot water for the decontamination unit shower. Activate from 30 amp circuit breaker on the electrical subpanel located within the decontamination unit. Provide with relief valve compatible with water heater operation; relief valve down to drip pan on floor with type L copper. Wiring of the hot water heater shall be in compliance with NEMA, NEC, and UL standards.
- H. The Abatement Contractor shall provide identification warning signs at power outlets, which are other than 110-120 volt power. Provide polarized outlets for plug-in type outlets, to prevent insertion of 110-120 plugs into higher voltage outlets. Dry transformers shall be provided where required to provide voltages necessary for work operations. All outlets or power supplies shall be protected by ground fault circuit interrupter (GFCI) at the power source.
- I. The Abatement Contractor shall use only grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Use single lengths or use waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas of work.
- J. The Abatement Contractor shall provide general service incandescent lamps of wattage indicated or required for adequate illumination; Protect lamps with guard cages or tempered glass enclosures; Provide exterior fixtures where fixtures are exposed to moisture.
- K. The Abatement Contractor shall provide temporary heat or air conditioning as necessary to maintain comfortable working temperatures inside and immediately outside the work areas. Heating and A/C equipment shall have been tested and labeled by UL, FM or another recognized trade association related to the fuel being used. Fuel burning heaters shall not be used inside containment areas. The Contractor shall also provide a comfortable working environment for occupied areas that are impacted by the asbestos removal.
- L. The Abatement Contractor shall comply with recommendations of the NFPA standard in regard to the use and application of fire extinguishers. Locate fire extinguishers where they are most convenient and effective for their intended purpose, but provide not less than one extinguisher in each work area, equipment room, clean room and outside the work area.

## **1.08 REMOVAL OF FIXTURES**

- A. In locations where the Abatement Contractor is directed to dispose of fixtures he shall either decontaminate the fixtures and dispose of them as non-asbestos containing materials or he shall place them in an appropriate container and dispose of them as asbestos containing material.
- B. In locations where the Abatement Contractor is directed to remove and reinstall fixtures, the fixtures shall be removed, decontaminated, labeled, protected with plastic and stored by the contractor in a location as directed by the Owner.
- C. Upon completion of the asbestos removal and upon receiving satisfactory clearance air monitoring results, all items to be replaced shall be restored to their original location and reinstalled by the Abatement Contractor.

## **PART 2 – PRODUCTS**

### **2.01 MATERIALS AND EQUIPMENT**

#### **A. GENERAL REQUIREMENTS**

1. Materials shall be stored off the ground, away from wet or damp surfaces and under protective cover to prevent damage or contamination.
2. Damaged or deteriorating materials shall not be used and shall be removed from the premises.
3. Power tools used to drill, cut into, or otherwise disturb asbestos material shall be equipped with HEPA filtered local exhaust ventilation.
4. The Abatement Contractor shall make available to authorized visitors, ladders and/or scaffolds of sufficient dimension and quantity so that all work surfaces can be easily and safely reached for inspection. Scaffold joints and ends shall be sealed with tape to prevent incursion of asbestos. Scaffolds and ladders shall comply with all applicable codes.

#### **B. PLASTIC BARRIERS (POLYETHYLENE)**

1. In sizes and shapes to minimize the number of joints.
  - a. Six mil. (.006") fire-retardant for vertical protection (walls, entrances and openings).
  - b. Six mil. (.006") fire-retardant for horizontal protection (fixed equipment) and heating grilles.
  - c. Six mil. (.006") reinforced fire-retardant for floors of decon units.
2. Provide two (2) layers over all roof, wall and ceiling openings. Floor penetrations shall be sealed with a rigid material prior to plasticizing to prevent tripping and fall hazards. All seams within a layer shall be separated by a minimum distance of six feet and sealed airtight. All seams between layers shall be staggered.
3. Barrier Attachment - Commercially available duct tape (fabric or paper) and spray-on adhesive. Duct tape shall be capable of sealing joints of adjacent sheets of plastic, facilitating attachment of plastic sheets to finished or unfinished surfaces of dissimilar materials and adhering under both dry and wet conditions.

C. SIGNS

1. Danger signs shall be provided and shall conform to 29 CFR 1926.1101 and be 14" x 20". These signs shall bear the following information:

**DANGER  
ASBESTOS  
CANCER AND LUNG DISEASE HAZARD  
RESPIRATORS AND PROTECTIVE  
CLOTHING  
ARE REQUIRED IN THIS AREA**

D. DANGER LABELS AND TAPE

1. Labels shall be affixed to any asbestos contaminated material in accordance with the requirements of 29 CFR 1910.1200 (f) of OSHA's Hazard Communication Standard, and shall contain the following information:

**DANGER  
CONTAINS ASBESTOS FIBERS  
AVOID BREATHING DUST  
CANCER AND LUNG DISEASE HAZARD**

2. A label shall be affixed on each container of asbestos waste in accordance with the requirements of 49 CFR Parts 171 and 172, Hazardous Substances; Final Rule (U.S. Department of Transportation), and shall contain the following information:

**RQ HAZARDOUS SUBSTANCE  
SOLID, NOS, ORM-E, NA 9188  
(ASBESTOS)**

3. A label shall be affixed on each container of asbestos waste in accordance with the requirements of 40 CFR Part 61.150, NESHAP; Asbestos; Final Rule (USEPA) and shall contain the name of the waste generator and the location at which the waste was generated.

NOTE: All containers marked as above (1,2 and 3) shall be disposed of as asbestos waste.

4. Provide 3" red barrier tape printed with black lettered "DANGER ASBESTOS REMOVAL". Locate barrier tape across all corridors, entrances and access routes to asbestos work area.

E. PROTECTIVE EQUIPMENT

1. Respiratory Requirements

- a. Where fiber levels permit, and in compliance with regulatory requirements, Powered Air Purifying Respirators are the minimum allowable respiratory protection permitted to be utilized during removal operations.
- b. Where not in violation of NIOSH, OSHA, and any other regulatory requirements, the Abatement Contractor shall provide the following minimum respiratory protection to the maximum use concentrations indicated:

<u>MSHA/NIOSH Approved Respiratory Protection</u>	<u>Maximum Use Concentration</u>
Half-Mask Air Purifying with HEPA Filters	10x PEL
Full-Facepiece Air Purifying HEPA Filters and Quantitative Fit Test	10x PEL
Powered Air Purifying (PAPR), Loose fitting Helmet or Hood, HEPA Filter	25x PEL
Powered Air Purifying (PAPR), Full Facepiece, HEPA Filter	50x PEL
Supplied Air, Continuous Flow Loose fitting Helmet or Hood	25x PEL
Supplied Air, Continuous Flow Full Facepiece, HEPA Filter	50x PEL
Full Facepiece-Supplied Air Pressure Demand, HEPA Filter	100x PEL
Full Facepiece-Supplied Air Pressure Demand, with Aux. SCBA, Pressure Demand or Continuous Flow	>100x PEL

- 2. Disposable Clothing -"Tyvek" manufactured by Dupont or approved equal.
- 3. NIOSH approved safety goggles to protect eyes.
- 4. Polyethylene bags, 6 mil. (.006") thick (use double bags).

NOTE: Workers must wear disposable coveralls and respirator masks at all times while in the work area. Contaminated coveralls or equipment must be left in work area and not worn into other parts of the building.

## F. TOOLS AND EQUIPMENT

1. Airless Sprayer - An airless sprayer, suitable for application of encapsulating material, shall be used.
2. Scaffolding - Scaffolding, as required to accomplish the specified work, shall meet all applicable safety regulations.
3. Transportation Equipment - Transportation equipment, as required, shall be suitable for loading, temporary storage, transport and unloading of contaminated waste without exposure to persons or property. Water tight, hard wall containers shall be provided to retain and dispose of any asbestos waste material with sharp-edged components that may tear plastic bags or sheeting. The containers shall be marked with danger labels.
4. Surfactant - Wetting Agents - "Asbestos-Wet" - Aquatrols Corp. of America or approved equal, and shall be non- carcinogenic.
5. Portable (negative air pressure) asbestos filtration system - by Micro-Trap, or approved equal.
6. Vacuum, HEPA type equal to "Nilfisk" #GA73, or "Pullman/Holt" #75 ASA.
7. Amended Water Sprayer - The water sprayer shall be an airless or other low-pressure sprayer for amended water application.
8. Other Tools and Equipment - The Abatement Contractor shall provide other suitable tools for the stripping, removal, encapsulation, and disposal activities including but not limited to: hand-held scrapers, nylon brushes, sponges, rounded edge shovels, brooms, and carts.

## **PART 3 – EXECUTION**

### **3.01 PRE-ABATEMENT WORK AREA PREPARATION**

- A. The work area shall be vacated by the occupants prior to work area preparation and not reoccupied until satisfactory clearance air monitoring results have been achieved.
- B. Caution signs shall be posted at all locations and approaches to a location where airborne concentrations of asbestos may exceed ambient background levels. Signs shall be posted that permit a person to read the sign and take the necessary protective measures to avoid exposure.
- C. Shut down and lock out electric power to all work areas. The Abatement Contractor shall provide temporary power and lighting and ensure safe installation of temporary power sources and equipment used where high humidity and/or water shall be sprayed in accordance with all applicable codes. All power to work areas shall be brought in from outside the area through a ground-fault interrupter at the source.
- D. Isolate the work area HVAC system.
- E. The personnel decontamination enclosure system shall be installed or constructed prior to preparatory work in the work area and in particular before the disturbance of asbestos material. The waste decontamination enclosure system shall be installed or constructed prior to commencement

of abatement activities.

- F. Movable objects within the work area shall be pre-cleaned using HEPA filtered vacuum equipment and/or wet cleaning and such objects shall be removed from the work area to an uncontaminated location. If disposed of as asbestos waste material, cleaning is not required.
- G. Fixed objects and other items, which are to remain within the work area, shall be pre-cleaned using HEPA filtered vacuum equipment and/or wet cleaning. Such objects shall be enclosed with two layers of at least six mil plastic sheeting and sealed with tape.
- H. The work area shall be pre-cleaned using HEPA filtered vacuum equipment and/or wet cleaning. Methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters, shall be prohibited. Asbestos material shall not be disturbed during pre-cleaning.
- I. Isolation barriers that seal off all openings, including windows, corridors, doorways, ducts, and any other penetrations of the work area, shall be constructed using two layers of at least six mil fire-retardant plastic sheeting sealed with tape. Also, all seams in mechanical system components that pass through the work area shall be sealed. Doorways and corridors, which shall not be used for passage during work, shall also be sealed.
- J. Removal of mounted objects. After isolation barriers are in place, objects such as light fixtures, electrical track, alarm systems, ventilation equipment and other items not previously sealed, shall be double sealed with six mil fire-retardant plastic sheeting. Localized HEPA filtered vacuum equipment shall be used during fixture removal to reduce asbestos dispersal.
- K. Individual roof and floor drains shall be sealed water tight using two layers of 6-mil fire-retardant plastic sheeting and tape prior to plasticizing. Openings in floor shall be fully covered with plywood sheeting secured to the floor in such a way as to minimize a tripping hazard prior to plasticizing.
- L. Emergency and fire exits from the work area shall be maintained or alternate exits shall be established according to all applicable codes.
- M. Adequate toilet facilities shall be supplied by the Abatement Contractor and shall be located either in the clean area of the personnel decontamination enclosure or shall be readily accessible to the personnel decontamination enclosure.

### **3.02 LARGE ASBESTOS PROJECT PERSONNEL DECONTAMINATION ENCLOSURE SYSTEM (ICR 56-7.5)**

- A. The personnel decontamination enclosure shall be constructed prior to preparatory work in the work area and in particular before the disturbance of asbestos material.
  - 1. Construction and use of personnel decontamination enclosure systems shall be in accordance with ICR-56 and any Applicable or Site Specific Variances utilized on this project. Such systems may consist of existing rooms outside of the work area, if the layout is appropriate, that can be enclosed is plastic sheeting and are accessible from the work area. When this situation does not exist, enclosure systems may be constructed out of metal, wood or plastic support.
  - 2. The personnel decontamination enclosure system shall consist of a clean room, a shower room, and an equipment room, in series, separated from each other and from the work area by three airlocks.

3. There shall be one shower per six full shift abatement persons calculated on the basis of the largest shift.
4. The personnel decontamination enclosure system shall be fully framed, sheathed for safety and constructed to prevent unauthorized entry.
5. Personnel decontamination enclosure systems constructed at the work site shall utilize at least six mil fire-retardant opaque plastic sheeting. At least two layers of six mil fire-retardant reinforced plastic sheeting shall be used for the flooring of this area.
6. All prefabricated decontamination units shall be completely decontaminated and sealed prior to separation and removal from the work area. Mobile decontamination units shall remain in place until satisfactory clearance results have been attained.
7. The clean room shall be sized to accommodate all authorized persons. Benches, lockers and hooks shall be provided for street clothes. Shelves for storing respirators shall also be provided. Clean clothing, replacement filters for respirators, towels and other necessary items shall be provided. The clean room shall not be used for the storage of tools, equipment or materials. It shall not be used for office space. A lockable door shall be provided to permit access to the clean room from outside the work area or enclosure. It shall be used to secure the work area and decontamination enclosure during off-shift hours.
8. The shower room shall contain one or more showers. Each shower head shall be supplied with hot and cold water adjustable at the tap. The shower enclosure shall be constructed to ensure against leakage of any kind. Uncontaminated soap, shampoo and towels shall be available at all times. Shower water shall be drained, collected and filtered through a system with at least 5.0 micron particle size collection capability. A system containing a series of several filters with progressively smaller pore sizes shall be used to avoid rapid clogging of the filtration system by large particles. Filtered wastewater shall be discharged in accordance with applicable codes. Contaminated filters shall be disposed of as asbestos waste. The shower room shall be constructed in such way that travel through the decontamination unit shall be through the shower.
9. The equipment room shall be used for the storage of equipment and tools after decontamination using a HEPA filtered vacuum and/or wet cleaning. A one day supply of replacement filters, in sealed containers, for HEPA vacuums and negative pressure ventilation equipment, extra tools, containers of surfactant and other materials and equipment that may be required during the abatement project may also be stored here. A walk-off pan filled with water shall be located in the work area just outside the equipment room for persons to clean foot covering when leaving the work area. A drum lined with a labeled, at least six mil plastic bag is required for collection of clothing and shall be located in this room. Contaminated footwear and work clothes shall be stored in this area.

### **3.03 WASTE DECONTAMINATION ENCLOSURE SYSTEM (ICR 56-7.5)**

#### **A. General Requirements**

1. A waste decontamination enclosure system shall consist of the following:
  - a. A washroom/cleanup room shall be constructed with an airlock doorway to the work area and

another airlock doorway to the holding area.

- b. The holding area shall be constructed with an airlock doorway to the washroom/cleanup room and another lockable door to the outside.
2. Where there is only one egress from the work area, the holding area of the waste decontamination enclosure system may branch off from the equipment decontamination room, which doubles as a waste washroom, of the personnel decontamination enclosure.
3. The waste washroom shall be equipped with a drain installed to collect water and deliver it to the shower drain where it shall be filtered through a system with at least 5.0 micron particle size collection capability. A system containing a series of several filters with progressively smaller pore sizes shall be used to avoid rapid clogging of the filtration system by large particles. Filtered wastewater shall be discharged in accordance with applicable codes. Contaminated filters shall be disposed of as asbestos waste.
4. The waste washroom shall be constructed in such a way that travel through the rooms shall be through the waste washroom

### **3.04 WORK AREA ENTRY AND EXIT PROCEDURES**

- A. The following procedures shall be followed throughout the asbestos abatement project until satisfactory clearance air monitoring results have been achieved:
  1. All persons shall enter and exit the work area through the personnel decontamination enclosure system.
  2. All persons who enter the work area or an enclosure shall sign the entry/exit log, located in the clean room, upon every entry and exit.
  3. All persons, before entering the work area, or an enclosure shall read and be familiar with all posted regulations, personal protection requirements, including work area entry and exit procedures, and emergency procedures. The entry/exit log headings shall indicate, and the signatures shall be used to acknowledge, that these have been reviewed and understood by all persons prior to entry.
  4. All persons shall proceed first to the clean room, remove all street clothing, store these items in clean sealable plastic bags or lockers and don coveralls, head covering, foot covering and gloves. All persons shall also don NIOSH approved respiratory protection. Clean respirators and protective clothing shall be utilized, by each person, for each separate entry into the work area. Respirators shall be inspected prior to each use and tested for proper seal using quantitative or qualitative fit checks.
  5. Persons wearing designated personal protective equipment shall proceed from the clean room through the shower room to the equipment room, where necessary tools are collected and any additional clothing shall be donned, before entry into the work area.
  6. Before leaving the work area, all persons shall remove gross contamination from the outside of respirators and protective clothing by brushing, wet cleaning, and/or HEPA vacuuming.

7. Persons shall proceed to the equipment room where all coveralls, head covering, foot covering and gloves shall be removed. Disposable clothing shall be deposited into labeled containers for disposal. Reusable contaminated clothing, footwear, head gear and gloves shall be stored in the equipment room when not being used in the work area.
8. Still wearing respirators, persons shall proceed to the shower area, clean the outside of the respirator and the exposed face area under running water prior to removal of the respirator, and then fully and vigorously shower and shampoo to remove residual asbestos contamination. Respirators shall be washed thoroughly with soap and water. Some types of respirators will require slight modification of these procedures. An airline respirator with HEPA filtered disconnect protection shall be disconnected in the equipment room and worn into the shower. A powered air-purifying respirator facepiece shall be disconnected from the filter/power pack assembly prior to entering the shower.
9. After showering and drying, all persons shall proceed to the clean room and don clean personal protective equipment if returning to the work area or street clothing if exiting the enclosure.

### **3.05 EQUIPMENT AND WASTE CONTAINER DECONTAMINATION & REMOVAL PROCEDURES**

- A. The following procedures shall be followed throughout the asbestos abatement project until satisfactory clearance air monitoring results have been achieved.
  1. External surfaces of contaminated containers and equipment shall be cleaned by wet cleaning and/or HEPA vacuuming in the work area before moving such items into the waste decontamination enclosure system airlock by persons assigned to this duty. These work area persons shall not enter the airlock.
  2. These contaminated items shall be removed from the airlock by persons stationed in the washroom during waste removal operations. These washroom persons shall remove gross contamination from the exterior of their respirators and protective clothing by brushing, HEPA vacuuming and/or wet cleaning.
  3. Once in the waste decontamination enclosure system, external surfaces of contaminated containers and equipment shall be cleaned a second time by wet cleaning.
  4. The cleaned containers of asbestos material and equipment are to be dried of any excessive pooled or beaded liquid, placed in uncontaminated plastic bags or sheeting and sealed airtight.
  5. The clean recontainerized items shall be moved into the airlock that leads to the holding area. The washroom persons shall not enter this airlock or the work area until waste removal is finished for that period.
  6. Containers and equipment shall be moved from the airlock and into the holding area by persons dressed in clean personal protective equipment, who have entered from uncontaminated areas.
  7. The cleaned containers of asbestos material and equipment shall be placed in water tight carts with doors or tops that shall be closed and secured. These carts shall be held in the holding area pending removal. The carts shall be wet cleaned and/or HEPA vacuumed at least once each day.

8. The exit from the decontamination enclosure system shall be secured to prevent unauthorized entry.
9. Where the waste removal enclosure is part of the personnel decontamination enclosure, waste removal shall not occur during shift changes or when otherwise occupied. Precautions shall be taken to prevent short circuiting and cycling of air outward through the shower and clean room.
10. Containers labeled with Asbestos hazard warnings shall not be used to dispose of non asbestos waste.

### **3.06 ENGINEERING CONTROLS**

#### **A. Ventilation.**

1. The Abatement Contractor shall employ HEPA equipped vacuums or negative air pressure equipment for ventilation as required.
2. All negative air pressure equipment ventilation units shall be equipped with HEPA filtration. The Contractor shall provide a manufacturer's test certificate for each unit documenting the capability of trapping and retaining 99.97 percent of asbestos fibers greater than 0.3 microns equivalent aerodynamic diameter.
3. A power supply shall be available to satisfy the requirements of the total of all ventilating units.
4. On electric power failure, abatement shall stop immediately and shall not resume until power is restored and exhaust units are operating fully. On extended power failure, longer than one hour, the decontamination facilities, after the evacuation of all persons from the work area, shall be sealed airtight.
5. If extending the exhaust of the ventilation units 50 feet from the building would result in an exhaust location either in the road, blocking driveway access to the facility or within 50 feet of other buildings, a second unit will be run in series with the primary unit.

### **3.07 MAINTENANCE OF DECONTAMINATION ENCLOSURE SYSTEMS AND WORK AREA BARRIERS**

#### **A. GENERAL REQUIREMENTS**

1. The Consultant must review and approve installation before commencement of work. Upon completion of the construction of all plastic barriers and decontamination system enclosures and prior to beginning actual abatement activities.
2. All plastic barriers inside the work area, in the personnel decontamination enclosure system, in the waste decontamination enclosure system and at partitions constructed to isolate the work area from occupied areas, shall be inspected by the asbestos supervisor at least twice daily. The barriers shall be inspected before the start of and following the completion of the day's abatement activities. Inspections and observations shall be documented in the project log.
3. Damage and defects in the barriers and/or enclosure systems shall be repaired immediately upon

discovery and prior to resumption of abatement activities.

4. At any time during the abatement activities, if visible emissions are observed outside of the work area or if damage occurs to the barriers, work shall be stopped, repairs made and visible residue immediately cleaned up using HEPA vacuuming methods prior to the resumption of abatement activities.
5. The Abatement Contractor shall HEPA vacuum and/or wet clean the waste decontamination enclosure system and the personnel decontamination enclosure system at the end of each day of abatement activities.

### **3.08 HANDLING AND REMOVAL PROCEDURES**

The Abatement Contractor may utilize existing provisions of ICR-56, Applicable Variances or a Site Specific Variance, approved by the Owner's Consultant, to permit the conduct of this work.

### **3.09 ABATEMENT PROCEDURES**

#### **A. AIR SAMPLING - By Owner**

1. Air sampling and analysis shall be conducted according to the requirements of Subpart 56-4 before the start, during and after the completion of the asbestos removal project.
2. In addition to the requirements of Subpart 56-4, air monitoring shall be conducted in accordance with any approved job specific variance(s) or applicable variance utilized.
3. Clearance samples may be analyzed using PCM to maintain compliance with ICR-56.
4. If applicable, clearance samples will be analyzed using TEM to maintain compliance with ICR-56 and 40 CFR 763.90[i].

B. The provisions of the Applicable Variances or a Job Specific Variance shall apply only in those areas where approval has been granted by the NYS DOL and the Contractor has obtained concurrence from the Owner's Consultant. All other applicable provisions of Industrial Code Rule 56-1 through 56-12 shall be complied.

C. A copy of the NYS DOL Job Specific or Applicable Variance, if applicable, shall be conspicuously posted at the work area(s).

D. The Abatement Contractor shall construct a decontamination unit at the work site. The Abatement Contractor shall, as a minimum, comply with the requirements of 29 CFR 1926.1101(j); Hygiene facilities and practices for employees.

### **3.10 ENCAPSULATION PROCEDURES**

The following procedures shall be followed to seal in non-visible residue, after obtaining satisfactory clearance air monitoring results, while conducting lockdown encapsulation on any surfaces which were the subject of removal or other remediation activities:

- A. Only encapsulants rated as acceptable or marginally acceptable on the basis of Battelle Columbus Laboratory test procedures and rating requirements developed under the 1978 USEPA contract shall be used for lockdown encapsulation.
- B. Sealants considered for use in encapsulation shall first be tested to ensure that the sealant is adequate for its intended use. A section of the work surface shall be evaluated following this initial test application of the sealant to quantitatively determine the sealant's effectiveness in terms of penetrating and locking down the asbestos fibers. The American Society of Testing and Materials (ASTM) Committee E06.21.06E on Encapsulation of Building Materials has developed a guidance document to assist in the selection of an encapsulant.
- C. The encapsulant solvent or vehicle shall not contain a volatile hydrocarbon.
- D. Encapsulants shall be applied using airless spray equipment.
  - 1. Spraying is to occur at the lowest pressure range possible to minimize fiber release from encapsulant impact at the surface. It shall be applied with a consistent horizontal or vertical motion.
- E. Encapsulation shall be utilized as a surface sealant once all asbestos containing materials have been removed in a work area. In no event shall encapsulant be applied to any surface that was the subject of removal or other remediation activities prior to obtaining satisfactory clearance air monitoring.

### **3.11 CLEANUP PROCEDURES**

- A. The following cleanup procedures shall be required.
  - 1. Cleanup of accumulations of loose asbestos material shall be performed whenever enough loose asbestos materials have been removed to fill a single leak tight container of the type commensurate with the material properties. In no case shall cleanup be performed less than once prior to the close of each working day. Asbestos material shall be kept wet until cleaned up.
  - 2. Accumulations of dust shall be cleaned off all surfaces on a daily basis using HEPA vacuum cleaning methods.
  - 3. Decontamination enclosures shall be HEPA vacuumed at the end of each shift.
  - 4. Accumulations of asbestos waste material shall be containerized utilizing HEPA vacuums or rubber or plastic dust pans, squeegees or shovels. Metal shovels shall not be used to pick up or move waste.
  - 5. Excessive water accumulation or flooding in the area shall require work to stop until the water is collected and disposed of properly.

- B. The following cleanup procedures shall be required after completion of all removal activities.
1. All accumulations of asbestos waste material shall be containerized utilizing HEPA vacuums or rubber or plastic dust pan, squeegees or shovels. Metal shovels shall not be used to pick up or move waste. HEPA vacuums shall be used to clean all surfaces after gross cleanup.
  2. Cleaning. All surfaces in the work area shall be HEPA vacuumed. To pick up excess liquid and wet debris, a wet purpose shop vacuum may be used and shall be decontaminated prior to removal from the work area.
  3. Windows, doors, HVAC system vents and all other openings shall remain sealed. Decontamination enclosure systems shall remain in place and be utilized.
  4. All containerized waste shall be removed from the work area and the holding area.
  5. All tools and equipment shall be decontaminated and removed from the work area.
  6. A final visual inspection and clearance air monitoring, as per the schedule for air sampling and analysis, shall be conducted.
  7. The isolation barriers and decontamination unit shall be removed only after satisfactory clearance air monitoring results have been achieved.

### **3.12 SAFETY MONITORING – CONSULTANT:**

The Consultant will designate an Asbestos Safety Technician (AST) to represent the Owner during the removal program. The AST must be on the job site at all times during abatement work. Absolutely no abatement or preparation work will occur without the presence of the AST.

The AST will conduct four (4) milestone inspections.

1. Pre-commencement inspection shall be conducted as follows:
  - a. Notification in writing to the Consultant shall be made by the Abatement Contractor to request a pre-commencement inspection at least 48 hours in advance of the desired date of inspection. This inspection shall be requested prior to beginning preparatory work in another work area.
  - b. The AST shall ensure that:
    - i. The job site is properly prepared and that all containment measures are in place;
    - ii. The designated supervisor shall present to the inspector a valid supervisor's license issued by the New York Department of Labor;
    - iii. All workers shall present to the inspector a valid handler's license issued by the New York Department of Labor;
    - iv. Measures for the disposal of removed asbestos material are in place and shall conform to the adopted standards;

- v. The Abatement Contractor has a list of emergency telephone numbers at the job site which shall include the monitoring firm employed by the Owner and telephone numbers for fire, police, emergency squad, local hospital and health officer.
- c. If all is in order, the AST shall issue a written notice to proceed in the field. If the job site is not in order, then any needed corrective action must be taken before any work is to commence. Conditional approvals shall not be granted.

Progress inspection shall be conducted as follows:

- a. Primary responsibility for ensuring that the abatement work progresses in accordance with these technical specifications and regulatory requirements rests with the Abatement Contractor. The AST shall continuously be present to observe the progress of work and perform required tests.
- b. If the AST observes irregularities at any time, he shall direct such corrective action as may be necessary. If the Abatement Contractor fails to take the corrective action required, or if the Abatement Contractor or any of their employees habitually and/or excessively violate the requirements of any regulation, then the AST shall inform the Owner who shall issue a Stop Work Order to the Abatement Contractor and have the work site secured until all violations are abated.

Clean-up inspections shall be conducted as follows:

- a. Notice for clean-up inspection shall be requested by the Abatement Contractor at least 24 hours in advance of the desired date of inspection;
  - b. The clean-up inspection shall be conducted prior to the removal of any isolation or critical barriers and before final air clearance monitoring;
  - c. The AST shall ensure that:
    - i. The work site has been properly cleaned and is free of visible asbestos containing material and debris.
    - ii. All removed asbestos has been properly placed in a locked secure container outside of the work area.
  - d. If all is in order, the AST shall issue a written notice of authorization to remove surface barriers from the work area. All isolation barriers shall remain in place until satisfactory clearance air sampling has been completed.
4. Clearance Visual Inspection shall be conducted after the removal of non-critical plastic sheeting. The AST shall insure that:
- a. The work area is free of all visible asbestos or suspect asbestos debris and residue.
  - b. All waste has been properly bagged and removed from the work area.
  - c. Should clearance visual inspection identify residual debris, as determined by the AST, the

Abatement Contractor is responsible for recleaning the area at his own cost and shall bear all costs of reinspection until acceptable levels are achieved.

- B. The Abatement Contractor shall be required to receive written approval before proceeding after each milestone inspection.

### **3.13 PERSONNEL AIR MONITORING – CONTRACTOR (29 CFR 1926.1101)**

- A. Personnel air monitoring shall be provided to determine both short-term (STEL) and full shift during when abatement activities occur. Personnel sampling shall be performed in each work area in order to accurately determine the concentrations of airborne asbestos to which workers may be exposed.
- B. The Abatement Contractor shall have a qualified "Competent Person" (as specified in 29 CFR 1926 OSHA) to conduct personnel air monitoring.
- C. The laboratory performing the air sample analysis shall be certified by NYS DOH ELAP and approved by the consultant.
- D. Personnel air monitoring test results for OSHA Compliance. Results shall be posted at the work site within 24 hours of testing and copies supplied to the Owner within five (5) days of testing. Abnormalities shall be supplied to the Owner immediately.

### **3.14 CLEARANCE AIR MONITORING**

- A. Air samples will be collected in and around the work areas at the completion of abatement activities.
- B. Clearance samples may be analyzed using PCM to maintain compliance with ICR-56.
- C. If applicable, clearance samples will be analyzed using TEM to maintain compliance with ICR-56 and 40 CFR part 763 “Asbestos-Containing Materials in Schools; Final Rule and Notice” section 763.90.
- D. \*\*\*RETESTING\*\*\*  
Should clearance air monitoring yield fiber concentrations above the “Clearance” criteria of either 0.01 fibers per CC and/or background levels (PCM) –OR- seventy (70) structures per square millimeter (TEM/AHERA), the Abatement Contractor is responsible for re-cleaning the area at his own cost and shall bear all costs associated with the retesting of the work area(s) including monitoring labor, sampling, analysis, etc. until such levels are achieved.

### **3.15 RESPIRATORY PROTECTION REQUIREMENT**

- A. Respiratory protection shall be worn by all individuals inside the work area from the initiation of the asbestos project until all areas have successfully passed clearance air monitoring in accordance with these specifications. The Abatement Contractor shall keep available at all times two PAPR's with new filters and charged batteries for use by authorized visitors.

- B. All respiratory protection shall be MSHA/NIOSH approved in accordance with the provisions of 30 CFR Part II. All respiratory protection shall be provided by the Abatement Contractor, and used by workers in conjunction with the written respiratory protection program.
- C. The Abatement Contractor shall provide respirators that meet the requirements of 29 CFR Parts 1910 and 1926.
1. Full facepiece Type C supplied-air respirators operated in pressure demand mode equipped with an auxiliary self-contained breathing apparatus, operated in pressure demand or continuous flow, shall be worn during gross removal, demolition, renovation and/or other disturbance of ACM whenever airborne fiber concentrations inside the work area are greater than 10.0 f/cc.
  2. Full facepiece Type C supplied-air respirators operated in pressure demand mode with HEPA filter disconnect protection shall be worn during gross removal, demolition, renovation and/or other disturbance of ACM with an amphibole content and/or whenever airborne fiber concentrations inside the work area are equal to or greater than 0.5 f/cc and less than or equal to 10.0 f/cc.
  3. Full facepiece powered air-purifying respirators (PAPR) equipped with HEPA filters shall be worn during the removal, encapsulation, enclosure, repair and/or other disturbance of friable ACM if airborne fiber concentrations inside the work area are less than 0.5 f/cc. A supply of charged replacement batteries, HEPA filters and flow test meter shall be available in the clean room for use with powered air-purifying respirators. HEPA filters shall be changed daily or as flow testing indicates change is necessary. Any Type C supplied-air respirator operated in continuous flow, with HEPA filter disconnect protection, may be substituted for a powered air-purifying respirator.
  4. Loose fitting helmets or hoods with powered air-purifying respirators (PAPR) equipped with HEPA filters may be worn during the removal, encapsulation, enclosure, repair and/or other disturbance of friable ACM if airborne fiber concentrations inside the work area are less than 0.25 f/cc. A supply of charged replacement batteries, HEPA filters and flow test meter shall be available in the clean room for use with powered air-purifying respirators. HEPA filters shall be changed daily or as flow testing indicates change is necessary. Any Type C supplied-air respirator operated in continuous flow may be substituted for a powered air-purifying respirator.
  5. Half-mask or full-face air-purifying respirators with HEPA filters shall be worn only during the preparation of the work area and final clean up procedures provided airborne fiber concentrations inside the work area are less than 0.1 f/cc.
  6. Use of single use dust respirators is prohibited for the above respiratory protection.
- D. Workers shall be provided with personally issued and individually marked respirators. Respirators shall not be marked with any equipment that will alter the fit of the respirator in any way. Only waterproof identification markers shall be used.
- E. The Abatement Contractor shall ensure that the workers are qualitatively or quantitatively fit tested by an Industrial Hygienist initially and every six months thereafter with the type of respirator he/she will be using.
- F. Whenever the respirator design permits, workers shall perform the positive and negative air pressure fit test each time a respirator is worn. Powered air-purifying respirators shall be tested for adequate flow as specified by the manufacturer.

- G. No facial hair, which interferes with the face-to-mask sealing surface, shall be permitted to be worn when wearing respiratory protection that requires a mask-to-face seal.
- H. Contact lenses shall not be worn in conjunction with respiratory protection.
- I. If a worker wears glasses, a spectacle kit to fit their respirator shall be provided by the Abatement Contractor at the Abatement Contractor's expense.
- J. Respiratory protection maintenance and decontamination procedures shall meet the following requirement:
  - 1. Respiratory protection shall be inspected and decontaminated on a daily basis in accordance with OSHA 29 CFR 1910.134(b); and
  - 2. HEPA filters for negative pressure respirators shall be changed after each shower; and
  - 3. Respiratory protection shall be the last piece of worker protection equipment to be removed. Workers must wear respirators in the shower when going through decontamination procedures; and
  - 4. Airline respirators with HEPA filtered disconnect shall be disconnected in the equipment room and worn into the shower. Powered air-purifying respirator facepieces shall be worn into the shower. Filtered/power pack assemblies shall be decontaminated in accordance with manufacturers' recommendations; and
  - 5. Respirators shall be stored in a dry place and in such a manner that the facepiece and exhalation valves are not distorted; and
  - 6. Organic solvents shall not be used for washing of respirators.
- K. No visitors shall be allowed to enter the contaminated area if they do not have their medical certification and training certificate. Authorized visitors shall be provided with suitable PAPR respirators and instructions on the proper use of respirators whenever entering the work area.

### **3.16 DISPOSAL OF WASTE**

#### **A. APPLICABLE REGULATIONS**

1. All asbestos waste shall be stored, transported and disposed of as per, but not limited to, the following Regulations:
  - a. NYS Code Rule 56
  - b. U.S. Department of Transportation (DOT)  
Hazardous Substances  
Title 29, Part 171 and 172 of the code of Federal Regulations  
regarding waste collector registration
  - c. Regulations regarding waste collector registration Title 6, part 364 of the New York State  
Official Compilation of Codes, Rules and Regulations – 6 NYCRR 364
  - d. USEPA NESHAPS 40 CRF 61
  - e. USEPA ASBESTOS WASTE MANAGEMENT GUIDANCE EPA/530-SW-85-007

#### **B. TRANSPORTER OR HAULER - The Abatement Contractor shall bear full responsibility for proper characterization, transportation and disposal of all solid or liquid waste, generated during the project, in a legal manner. The Owner shall approve all transportation and disposal methods.**

1. The Abatement Contractor's Transporter (hauler) and disposal site shall be approved by the Owner. The Abatement Contractor shall remove within 48 hours all asbestos waste from the site after completing the clean up.
2. The Transporter must possess and present to the Owner's representative a valid New York State Department of Environmental Conservation Part 364 asbestos hauler's permit to verify license plate and permit numbers. The Owner's representative will verify the authenticity of the hauler's permit with the proper authority.
3. The Abatement Contractor shall give 24 hour notification prior to removing any waste from the site. All waste shall be removed from site only during normal working hours. No waste may be taken from the site without authorization from the Owner's representative.
4. The Abatement Contractor shall have the Transporter give the date and time of arrival at the disposal site.
5. The Transporter with the Abatement Contractor and Owner's consultant shall inspect all material in the transport container prior to taking possession and signing the Waste Manifest. The Transporter shall not have any off site transfers or be combined with any other off-site asbestos material.
6. The Transporter must travel directly to the disposal site with no unauthorized stops.

#### **C. WASTE STORAGE CONTAINER**

1. During loading and on site storage, the asbestos waste container shall be labeled with EPA  
Danger signage:

**DANGER  
CONTAINS ASBESTOS FIBERS  
AVOID CREATING DUST  
CANCER AND LUNG DISEASE HAZARD**

2. The NYS DEC Hauler's Permit number shall be on both sides and back of the container.
3. The Container will not be permitted to leave the site without the proper signage.
4. A copy of the completed waste manifest shall be forwarded directly to the Owner's Consultant by the disposal facility.
5. Packaging of Non-friable Asbestos. Use of an open top container shall require written request, by the Contractor, and written approval by the Owners Representative, and be performed in compliance with all applicable regulations.
  - a) A chute, if used, shall be air/dust tight along its lateral perimeter and at the terminal connection to the dumpster at ground level (solid wall and top container). The upper end of the chute shall be furnished with a hinged lid, to be closed when the chute is not being used.
  - b) The container shall be lined with a minimum of two (2) layers of 6 mil. Fire-retardant polyethylene draped loosely over the sides so as to facilitate being wrapped over the top of the load and sealed prior to transport from the site.
  - c) Prior to transport from the work site the Dumpster will be disconnected from the chute and sealed air/dust tight utilizing six mil plastic and tape. The waste material will be transported as an asbestos containing material by appropriate legal methods.
6. Packaging Friable Asbestos.
  - a) The container shall be a solid wall, hard top and lockable container.
  - b) The container shall be locked upon arrival at the site to restrict access. Security shall be provided at the entrance to the container during the loading process and immediately locked upon completion.
  - c) The interior walls, floor and ceiling shall be lined with two (2) layers of 6 mil. Fire-retardant polyethylene.
  - d) The waste shall be loaded in such a manner as to protect the integrity of the individual waste packages.
  - e) Prior to transport from the work site the interior of the Dumpster will sealed air/dust tight utilizing six mil plastic and tape. The waste material will be transported as an asbestos containing material by appropriate legal methods.

#### D. WASTE DISPOSAL MANIFEST

1. The Asbestos Waste Manifest shall be equivalent to the "Waste Shipment Record" included in 40 CFR 61. A copy of the Contractor's manifest shall be reviewed by the Owner's Consultant and shall be the only manifest used.
2. The Manifest shall be verified by the Owner's Consultant indicating that all the information and amounts are accurate and the proper signatures are in place.
3. The Manifest shall have the signatures of the Abatement Contractor and the Transporter prior to any waste being removed from the site.
4. The Manifest shall be signed by the Disposal Facility owner or operator to certify receipt of asbestos containing materials covered by the manifest.
5. A copy of the completed manifest shall be provided by the Abatement Contractor to the Owner's Consultant and remain on site for inspection.
6. Abatement Contractor shall maintain a waste disposal log which indicates load number, date and time left site, container size, type of waste, quantity of waste, name of hauler, NYS DES permit number, trailer and tractor license number, and date manifest was returned to Consultant.
7. The Disposal Facility owner or operator shall return a signed copy of the Waste Manifest directly to:

**Mount Pleasant CSD  
825 Westlake Drive  
Thornwood, New York 10594  
ATTN: Eric Strack**
8. Copies of the completed Waste Manifest are to be sent by the disposal facility to the Hauler and Abatement Contractor.
9. Submit signed dump tickets and manifests with final payment request.
10. Final payment request will not be honored without signed dump ticket or manifests accounting for all asbestos waste removed from the site.

#### E. VIOLATIONS OF SPECIFICATIONS

1. Violations of the safety, hygiene, environmental, procedures herein, any applicable federal, state or local requirements or failure to cooperate with the Owner's representative shall be grounds for dismissal and/or termination of this contract.

## F. VIOLATIONS OF NO SMOKING POLICY

1. The Federal Pro Children Act of 1994 prohibits School District Officials from smoking in any buildings or on the grounds that is property of the School District. The District shall be considered smoke free. The School District strongly enforces its' No Smoking Policy. It is the Contractor's responsibility to inform all workers of this policy. Any worker(s) involved with this project that are found smoking or using tobacco products will be informed that they are in violation of the Federal and State Law and School Board Policy and will be removed from site.

**3.17 LOCATION OF “ABATEMENT WORK”**

*(Please see attached Drawings for approximate locations)*

**1) WESTLAKE HIGH SCHOOL (INTERIOR ABATEMENTS)**

- Abatement Contractor responsible for total and complete removal and disposal of approximately 190 SF of non-friable asbestos-containing Ceiling Tiles, and approximately 122 Mudded Joint Packing on metal pipe elbows, and 400 LF of Pipe Insulation as detailed on attached ACM Location Drawings. Prior to abatement activities, The Owner will perform removal of furniture, cabinets, storage, etc...to allow access to materials below. Subsequent to final air clearance, the substrates shall be washed with a neutralizing agent to prepare the substrate to accept new floor covering(s) and eliminate residual odors. The Owner and/or General Contractor responsible for re-installation of non-asbestos ceiling tiles and metal elbow insulation. Pipe Insulation and Mudded Joint Packing in Bathrooms and Shower Rooms are presumed. ***If NO ACM pipe insulation and/or mudded joint packing is discovered, the General Contractor will be responsible for removal and not abatement contractor.*** See below for breakdown:

Girl’s Coaches Office and Closets Ceiling, 1’x1’ Splined	ACM Ceiling Tiles ACM Mudded Joint Packing	155 SF 5 Elbows
Girl’s Coaches Office, Above Plaster Ceiling	ACM Mudded Joint Packing	5 Elbows
Girl’s Locker Room	ACM Mudded Joint Packing	20 Elbows
Girl’s Locker Room Custodial Closet, Ceiling, 1’x1’ Splined	ACM Ceiling Tiles	16 SF
Girl’s Locker Room Storage	ACM Mudded Joint Packing	5 Elbows
Girl’s Locker Room Bathroom and Shower Rooms	ACM Pipe Insulation & Associated Mudded Joint Packing	200 LF Pipe Insulation 40 Elbows
Boy’s Coaches Office, Above Suspended Ceiling Tiles	ACM Mudded Joint Packing	4 Elbows
Boy’s Coaches Office, Bathroom, Above Plaster Ceiling	ACM Mudded Joint Packing	5 Elbows
Boy’s Locker Room	ACM Mudded Joint Packing	20 Elbows
Boy’s Coaches Office, Closets, Ceiling, 1’ x 1’ Splined (2 Closets)	ACM Ceiling Tiles	8 SF Each Closet
Boy’s Locker Room Storage	ACM Mudded Joint Packing	8 Elbows
Boy’s Locker Room Bathroom and Shower Room	ACM Pipe Insulation & Associated Mudded Joint Packing	200 LF Pipe Insulation 40 Elbows
Storage Room off of Gym on Boy’s Side	ACM Mudded Joint Packing	10 Elbows

### **3.18 GENERAL**

- A. The Abatement Contractor will be responsible for repairing all building components damaged during abatement including, but not limited to: ceiling tiles, ceiling finishes, wall finishes, floor finishes, etc.
- B. The Abatement Contractor shall be responsible for all demolition required to access materials identified in scope of work and on associated drawings.
- C. Concealed conditions that are exposed and may require additional work shall be brought to the attention of the Owner immediately. The Abatement Contractor shall not abate these areas without a written notice to proceed. Additional asbestos abatement performed prior to the order to proceed will not be acknowledged.
- D. The Abatement Contractor shall remove asbestos-containing floor covering to the building substrate beneath; in areas indicted. Subsequent to final air clearance the substrate shall be washed with a neutralizing agent to prepare the substrate to accept new floor covering and eliminate residual odors.
- E. Power tools used to drill, cut into or otherwise disturb asbestos containing material shall be equipped with HEPA filtered local exhaust ventilation.
- F. The Abatement Contractor shall provide access to GFCI electrical power, required to perform the area air monitoring for this project, within and immediately adjacent to each work area.
- G. Unwrapped or unbagged ACM shall be immediately placed in an impermeable waste bag or wrapped in plastic sheeting.
- H. Coordinate all removal operations with the Owner.

**Asbestos Employee Medical Examination Statement**  
**Certificate of Worker Release**  
**Asbestos Employee Training Statement**  
**CERTIFICATE OF WORKERS'S ACKNOWLEDGEMENT**

PROJECT NAME: **Mount Pleasant CSD2020 Westlake High School Physical Education Department Renovations**

CONTRACTOR'S NAME: \_\_\_\_\_

WORKING WITH ASBESTOS INVOLVES POTENTIAL EXPOSURE TO AIRBORNE ASBESTOS FIBERS. INHALING ASBESTOS FIBERS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCER AND RESPIRATORY DISEASES. SMOKING CIGARETTES AND INHALATION OF ASBESTOS FIBERS INCREASES THE RISK THAT YOU WILL DEVELOP LUNG CANCER ABOVE THAT OF THE NON-SMOKING PUBLIC.

The Contract for this project requires your employer to 1) supply proper respiratory protection devices and training on their use 2) provide training on safe work practices and on use of the equipment used on the project 3) provide a medical examination meeting the requirements of 29 CFR 1926.1101. Your signature on this certificate, documents that your employer has fulfilled these contractual obligations and you understand the information presented to you.

**\*\*\*\*\*DO NOT SIGN THIS FORM UNLESS YOU FULLY UNDERSTAND THIS INFORMATION\*\*\*\*\***

RESPIRATORY PROTECTION: I have been trained in the proper use and limitations of the type of respiratory protection devices to be used on this project. I have reviewed the written respiratory protection program manual and a copy is available for my use. Respiratory protection equipment has been provided, by the Contractor, at no cost to me.

TRAINING COURSE: I have been trained in the risks and dangers associated with handling asbestos, breathing asbestos dust, proper work procedures, personal protection and engineering controls. I have satisfactorily completed and Asbestos Safety Training Program for New York State and have been issued a New York State Department of Health Certificate of Asbestos Safety Training.

MEDICAL EXAMINATION: I have satisfactorily completed a medical examination within the last 12 months that meets the OSHA requirement for an asbestos worker and included at least 1) medical history 2) pulmonary function 3) medical examination 4) approval to wear respiratory protection devices and may have included an evaluation of a chest x-ray.

Signature: \_\_\_\_\_ Date \_\_\_\_\_

Printed Name: \_\_\_\_\_ SS#: \_\_\_\_\_

Witness: \_\_\_\_\_ Date: \_\_\_\_\_

Mount Pleasant CSD: 2020 Westlake High School Physical Education Department Renovations

ESTIMATE OF ACM QUANTITIES

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\*\*\*\*\*

EACH ABATEMENT CONTRACTOR SHALL READ AND ACKNOWLEDGE THE FOLLOWING NOTICE. A SIGNED AND DATED COPY OF THIS ACKNOWLEDGMENT SHALL BE SUBMITTED WITH THE ABATEMENT CONTRACTOR'S BID FOR THIS PROJECT. FAILURE TO DO SO MAY, AT THE SOLE DISCRETION OF THE OWNER, RESULT IN THE BID BEING CONSIDERED NON-RESPONSIVE AND RESULT IN DISQUALIFICATION OF THE ABATEMENT CONTRACTOR'S BID ON THIS PROJECT.

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**\*\*\* NOTICE \*\*\***

*The linear and square footages listed within this specification are approximates. Abatement Contractor is required to visit the work locations prior to bid submittal in order to take actual field measurements within each listed location. The Abatement Contractor shall base their bid on actual quantities determined, by them, at the site walkthrough. Estimates provided in these specifications are for informational purposes only and shall not be considered a basis for Change Orders on this project.*

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**Acknowledgment:** I have read and understand the above NOTICE regarding removal quantity estimates and understand that estimates provided in these specifications are for informational purposes only and shall not be considered a basis for Change Orders on this project. The Abatement Contractor's signatory represents to the Owner that he/she has the authority of the entity he/she represents to sign this agreement on its behalf.

Company Name: \_\_\_\_\_  
Type or Print

BY: \_\_\_\_\_  
Signature Title Date

Print Name: \_\_\_\_\_

**ASSOCIATED ASBESTOS REMOVAL LOCATION DRAWINGS**

- **Mount Pleasant CSD: 2020 Westlake High School Physical Education Department Renovations**
- ***ASB-01 – Westlake High School – Locker Rooms & Coaches Office Asbestos Abatement***

**END OF SPECIFICATION  
SECTION 020800**

Mount Pleasant CSD/Physical  
Education Department Renovations  
at Westlake High School  
NYSESED # 66-08-01-06-0-005-020

028200-44

#4.1449.08

**SECTION 02 83 00 – LEAD-BASED PAINT WORK PRACTICES**

AT: MOUNT PLEASANT CSD– WESTLAKE HS  
PHYSICAL EDUCATION DEPARTMENT  
THORNWOOD, NY 10594

OWNER: MOUNT PLEASANT CSD  
825 WESTLAKE DRIVE  
THORNWOOD, NEW YORK 10594

CONSULTANT: QUALITY ENVIRONMENTAL SOLUTIONS  
& TECHNOLOGIES, INC. (QUES&T)  
1376 ROUTE 9  
WAPPINGERS FALLS, NEW YORK 12590  
PH. (845) 298-6031  
FX. (845) 298-6251

***SPECIFICATION DATED: April 6, 2020***

## SECTION 02 83 00 – LEAD SAFE WORK PRACTICES

### PART 1 - GENERAL

#### 1.1 DESCRIPTION/SCOPE OF WORK

- A. The work covered by these specifications shall consist of furnishing all labor, materials, tools, and equipment necessary to control and mitigate potential lead-based paint (LBP) hazards during demolition/renovation activities pertaining to the *MOUNT PLEASANT CSD– Physical Education Department Renovations*

<b>WESTLAKE HIGH SCHOOL</b>
-----------------------------

- Boy's Locker Room, Back Room, Wall Ceramic Tile, Yellow
- Boy's Locker Room, Closet, Slop Sink, Metal, White

Additionally, it should be noted that several components tested did in fact contain minimal lead-levels below the EPA/HUD threshold level of 0.50% by weight for classification as Lead-Based Paint (LBP) and are considered lead-containing coatings by the OSHA Regulation, "Lead Exposure in Construction" (29 CFR 1926.62). OSHA does not recognize a minimum limit for lead concentration in paint for the purpose of disturbance. Monitoring of workers performing demolition/cleaning/disturbance of painted surfaces shall be completed to document personnel occupational exposure. Items containing any amount of lead concentration are considered lead-containing coatings per 29 CFR 1926.62, OSHA Lead Exposure in Construction.

The work of this Contractor shall include the following, and shall be as required by specific work-related tasks and disturbance(s) of above-referenced Lead-based Paint(s) and/or Lead-containing Material(s), above the EPA action level of 1.0 mg/sq. cm:

- 1) Personnel air monitoring and analysis.
  - 2) Waste characterization and classification.
  - 3) Transportation/disposal off-site of LBP wastes/debris and lead-contaminated waste/debris generated from LBP disturbance(s).
- A. Manual demolition, scraping and manual sanding of lead-based paint surfaces and power tool cleaning with dust collection systems shall be performed in conjunction with engineering and work practice controls meeting the requirements of 29 CFR 1926.62(e)(1).
- B. Components with lead-based paint shall be removed intact to the extent practicable. A 6-mil polyethylene drop cloth shall be placed on either side of the component, prior to its removal, to catch any paint chips that may become dislodged. The component shall be wrapped in a layer of 6-mil polyethylene for movement to the disposal container. Follow proper disposal requirements. The area around the component removal shall be wet wiped and HEPA vacuumed, including the tent enclosure. The polyethylene sheeting shall be carefully folded in on itself and placed in a 6-mil disposal bag. Containment debris shall be properly disposed of as lead-based waste.
- C. Chemical stripping should be used for LBP removal on surfaces that will be subjected to welding, cutting or torch burning. No chemical strippers containing methylene chloride shall be used by

the Contractor on this project. Abrasive blasting, heat stripping, uncontained hydroblasting, welding, cutting or torch burning shall not be performed on surfaces where LBP is present. Abrasive blasting, heat stripping, uncontained hydroblasting, welding, cutting or torch burning shall only be performed on bare metal substrate.

- D.** The Contractor's use of a subcontractor shall not relieve the Contractor of full responsibility for the work to be performed.
- E.** If available, the Contractor may submit exposure assessment data obtained within the last twelve (12) months from previous jobs conducted under similar conditions, control methods, work practices and environmental conditions to be used in this contract. Other objective data may be used to demonstrate that work activities in this contract will not result in occupational exposures to airborne lead that exceeds the PEL. The assessment shall include comparable lead concentrations in coating materials, work practices, engineering controls and rates of work.
- F.** Until the exposure assessment is performed, the Contractor must provide to his workers the following: Respiratory protection with a minimum protection factor of 10, personal protective clothing, lead-free change areas, hand washing/shower facilities, biological monitoring and training per 29 CFR 1926.62.
- G.** This Specification shall be used as a Guideline for the use of Contractors who complete the demolition/renovation activities pertaining to the ***MOUNT PLEASANT CSD – PHYSICAL EDUCATION DEPARTMENT RENOVATIONS*** as detailed within Section #1.2 of this specification. The intent of this Specification is to remain in conformance with 29 CFR 1926.62 and to maintain an airborne concentration of lead-dust below the action level. This Specification is written in order to outline the worst case scenario in regard to lead safe work practices. However, the work procedures section is written in a manner, which outlines the requirements that should be necessary, at a minimum, to maintain an airborne concentration of lead dust below the action level.
- H.** The Contractor shall ensure that any HVAC equipment intakes within and around the work areas are protected by shutting down the units and/or installing HEPA filters over the intake. The Contractor shall coordinate rebalancing of the HVAC equipment prior to installing the HEPA filters. The Contractor shall alter the size and extent of the isolation barriers as necessary due to weather conditions, functional space use and density of building occupants in the vicinity, as required.

## **I. 1.2 REGULATIONS & REFERENCE STANDARDS**

### **A. General Requirements**

All work of this section shall be conducted in strict accordance with all applicable Federal, State and Local regulations.

Matters of interpretations of the standards and regulations shall be submitted to the appropriate agency for resolution before starting work. Where these requirements vary the most stringent shall apply.

### **B. Specific Requirements**

1. American National Standards Institute (ANSI)

- a. ANSI Z9.2-79 – Fundamentals Governing the Design and Operation of Local Exhaust Systems.
  - b. Z88.2-80 – Practice for Respiratory Protection.
2. Title X - U.S. Department of Housing and Urban Development “Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing.”
3. Code of Federal Regulations (CFR)
- a. 29 CFR Part 1910.120 – Hazardous Waste Operations and Emergency Response.
  - b. 29 CFR Part 1910.134 – Respiratory Protection.
  - c. 29 CFR Part 1910.146 – Confined Space Entry Program.
  - d. 29 CFR Part 1910.1025 – Lead.
  - e. 29 CFR Part 1910.1200 – Hazard Communication.
  - f. 29 CFR Part 1926.55 – Gases, Vapors, Fumes, Dusts and Mists.
  - g. 29 CFR Part 1926.57 – Ventilation.
  - h. 29 CFR Part 1926.62 – Lead (Construction Industry Standard).
  - i. 40 CFR Part 260 – Hazardous Waste Management Systems: General.
  - j. 40 CFR Part 261 – Identification and Listing of Hazardous Waste.
  - k. 40 CFR Part 262 – Generators of Hazardous Wastes.
  - l. 40 CFR Part 263 – Transporters of Hazardous Waste.
  - m. 40 CFR Part 264 – Owners and Operators of Hazardous Waste Treatment, Storage & Disposal Facilities.
  - n. 40 CFR Part 265 – Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage & Disposal Facilities.
  - o. 40 CFR Part 268 – Land Disposal Restrictions.
  - p. 40 CFR Part 745 – Lead; Requirements for Lead-Based Paint Activities in Child Occupied Facilities
  - q. 40 CFR Part 745.90 – EPA’s Renovation, Repair & Painting Rule.
  - r. 49 CFR Parts 170-178 – Department of Transportation Regulations.
4. New York Codes of Rules and Regulations (NYCRR)
- a. 6 NYCRR Part 360 – Solid Waste Regulations.
  - b. 6 NYCRR Part 364 – Waste Transporter Permits.
  - c. 6 NYCRR Part 370-373 – Hazardous Waste Regulations.

- d. 8 NYCRR Part 155 – Uniform Safety Standards for School Construction & Maintenance Projects.
- 5. Steel Structures Painting Council (SSPC)
  - a. SSPC-Guide 6 – Guide for Containing Debris Generated During Paint Removal Operations.  
  
SSPC-Guide 7 – Guide for the Disposal of Lead-Contaminated Surface Preparation Debris.  
  
Preparation Debris.
- 6. Underwriters Laboratories. Inc. (UL)
  - a. UL 586 – High Efficiency, Particulate Air Filter Units.

### 1.3 DEFINITIONS

- A. **Abatement**  
For the purposes of this Specification, the term abatement shall refer to any procedure that impacts lead-based paint on any surface. Procedures can include: paint removal; whole removal of the surface (i.e. window replacement); demolition of painted surfaces; and clean-up of paint debris.
- B. **Action Level**  
Employee exposure without regard to use of respirators, to an airborne concentration of lead of thirty (30) micrograms per cubic meter of air averaged over an 8-hour period. As used in this section, micrograms per cubic meter of air” refers to the action level. (Note: For longer exposure period lower action level is triggered).
- C. **Area Monitoring**  
Sampling of lead concentrations within the lead control area (work area) and inside the physical boundaries which is representative of the airborne lead concentrations that may reach the breathing zone of personnel potentially exposed to lead.
- D. **Physical Boundary**  
Area physically roped or partitioned off around a work area to limit unauthorized entry of personnel. As used in this section, “inside boundary” shall mean the same as “outside lead control area.”
- E. **Change Rooms and Shower Facilities**  
Rooms within the designated physical boundary around the work area equipped with separate storage facilities for clean protective work clothing and equipment and for street clothes which prevent cross-contamination.
- F. **Decontamination Room**  
Room for removal of contaminated personal protective equipment (PPE).
- G. **Eight-Hour Time Weighted Average (TWA)**  
Airborne concentration of lead averaged over an 8-hour workday to which an employee is exposed.
- H. **High Efficiency Particulate Air (HEPA) Filter Equipment**

HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead-contaminated paint dust. A high efficiency particulate filter means 99.97 percent efficient against 0.3 micron size particles.

- I. **Lead Control Area**  
A work area within which engineering controls are implemented to prevent the spread of lead dust, paint chips or debris from lead-containing paint removal operations. The lead control area is isolated by physical boundaries to prevent entry of unauthorized personnel.
- J. **Lead Permissible Exposure Limit (PEL)**  
Fifty (50) micrograms per cubic meter of air as an 8-hour time weighted average as determined by 29 CFR Part 1926.62. If an employee is exposed for more than 8 hours in a work day, the PEL shall be determined by the following formula:  
$$\text{PEL (micrograms/cubic meter of air)} = 400/\text{No. hrs worked per day}$$
- K. **Personal Monitoring**  
Sampling of lead concentrations within the breathing zone of an employee to determine the 8-hour time weighted average concentration in accordance with 29 CFR Part 1926.62. Samples shall be representative of the employees work tasks. Breathing zone shall be considered an area within a hemisphere, forward of the shoulders with a radius of 6 to 9 inches and the center at the nose or mouth.
- L. **Wipe Sampling**  
Clearance testing procedures, which determine the amount of existing lead-based paint surface dust by atomic absorption spectroscopy analysis, or inductively coupled plasma emission spectrometry expressed in micrograms of lead.

#### 1.4 QUALITY ASSURANCE

- A. **Qualifications**
  1. **Contractor:** Certification that the Contractor has prior experience on LBP activity projects similar in nature and extent to ensure the capability to perform the required work procedures in a satisfactory manner.
  2. **Competent Person:** Certification that the Contractor's full-time onsite Competent Person meets the competent person requirements of 29 CFR Part 1926.62 and is experienced in administration and supervision of LBP activity projects, including work practices, protective measures for building and personnel, disposal procedures, etc. This person shall have completed a Contractor Supervisor LBP abatement course by an EPA Training Center or an equivalent certification course, and have had a minimum of 2 years on-the-job experience.
  3. **Testing Laboratory:** The name, address, and telephone number of the independent testing laboratory selected to perform sampling and analysis for personal and area air samples and wipe samples, and TCLP analysis of LBP wastes and debris. Documentation that the laboratory performing the analysis is an EPA National Lead Laboratory Accreditation Program (NLLAP) accredited laboratory and that it is listed proficient in the NIOSH/EPA Environmental Lead Proficiency Analytical Testing Program (ELPAT), and a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certified laboratory. Certification shall include accreditation for heavy metal analysis, list of experience relevant to analysis of lead in air, and a Quality Assurance and Quality Control Program. Currently, the American Association for Laboratory Accreditation (ASLA) and the American Industrial Hygiene Association (AIHA) are the

EPA recognized laboratory accreditors. Documentation shall include the date of accreditation or reaccreditation.

4. Blood Lead Testing Laboratory: The name, address and telephone number of the blood lead testing laboratory; the laboratory's listing by OSHA and the U.S. Public Health Service Center for Disease Control (CDC); and documentation that the laboratory certified in the state where the work site is located.
- B. Respiratory Protection Devices  
Manufacturer's certification of NIOSH for respiratory protection devices utilized on the site.
- C. Cartridges, Filters, and Vacuum Systems  
Manufacturer's certification of NIOSH approval of respirator cartridges (organic vapor, acid gas, mist, dust, high efficiency particulate); High Efficiency Particulate Air (HEPA) filtration capabilities for all cartridges, filters, and HEPA vacuum systems.
- D. Medical Examination and Records  
Certification that employees who are involved in LBP abatement work have received medical examinations and will receive continued medical surveillance, including biological monitoring, as required by 29 CFR Part 1926.62, 29 CFR Part 910.1200, 29 CFR Part 1910.120 and by the state and local regulations pertaining to such work. Records shall be retained, at Contractor expense, in accordance with 29 CFR Part 1910.20.
1. Provide medical surveillance to workers until exposure monitoring reveals that workers are not exposed on any day of the job to airborne lead at or above the Action Level of 30 ug/dL of blood. This consists of a blood test measuring the level of lead and zinc protoporphyrin by a licensed physician. Further testing and medical exams may be necessary depending on the results of initial blood tests and/or the initial exposure assessment.
- E. Training  
Training certification shall be provided prior to the start of work involving LBP abatement, for all of the Contractors' workers, supervisors and Competent Person. Training shall meet the requirements of 29 CFR Part 1926.62, 29 CFR Part 1926.59, 29 CFR Part 1910.1200, 29 CFR Part 1910.120 and 49 CFR 172, and that required by EPA or the state LBP course for the work to be performed. Training shall be provided prior to the time of job assignment and, at least, annually. The project specific training shall at a minimum, include the following.
1. Specific nature of the operation, which could result in exposure to lead.
  2. Purpose, proper selection, fitting, use and limitations of respirators.
  3. Purpose and description of the medical surveillance program and the medical removal protection program, including information concerning the adverse health effects associated with excessive exposure to lead (with particular attention to the adverse reproductive effects on both males and females and hazards to the fetus and additional precautions for employees who are pregnant.)
  4. Relevant engineering controls and good work practices.
  5. The contents of any compliance plan in effect.
  6. Instructions to employees that chelating agents should not routinely be used to remove lead from their bodies and should not be used at all except under the direction of a licensed physician.

7. The employee's right of access to records under 29 CFR Part 1910.20.

F. Respiratory Protection Program

1. Furnish each employee required to wear a negative pressure respirator or other appropriate type with a respirator fit test at the time of initial fitting and at least every 12 months thereafter as required by 29 CFR Part 1910.134 and 29 CFR Part 1926.62.
2. Establish and implement a respiratory protection program as required by ANSI Z88.2, 29 CFR Part 1910.134 and 29 CFR Part 1926.62.
3. All workers are required to don an appropriate level of protection commensurate with the airborne concentrations of lead in which they are working. The level of protection will be determined by the Contractor, based on objective air monitoring data.

G. Licenses and Permits

Copies of licenses and permits as required by applicable Federal, state and local regulations shall be obtained before the start of the LBP project.

**1.5 SUBMITTALS**

A. The submittals shall be submitted in accordance with Specification Section 01300, Submittals.

B. Certifications

Prior to the start of work, submit required certifications, plans, programs, permits and licenses identified in Paragraph 1.5 of this specification section.

C. Equipment List

Prior to the start of work submit list of equipment items to be used in the work, including brand names, model, capacity, performance characteristics, quantities and other pertinent information.

D. Lead-Based Paint (LBP) Management Plan

The contractor shall prepare a detailed LBP Management Plan that identifies the work procedures, health and safety measures to be used in LBP work procedures; and that addresses spill prevention, containment and emergency response procedures. The plan shall address the methods to be undertaken to abate the lead to include the following key elements:

1. LBP containment methods to control employee exposure to lead at or below the permissible exposure limit and to ensure that airborne lead concentrations of 30 micrograms per cubic meter of air are not exceeded outside of the lead control area.
2. Training requirements as required by Federal, state and local regulations.
3. Unique problems associated with the LBP project.
4. Sketch of location, size and details of LBP control areas, decontamination rooms/areas, change rooms and shower facilities.
5. Eating, drinking, smoking, and rest room procedures.
6. Sequencing of LBP related work.
7. Personnel protective equipment and respiratory protection program, including controls.

8. Engineering controls, containment structures and safety measures.
  9. Worker exposure assessment procedures.
  10. Work Practice controls.
  11. Housekeeping.
  12. Hygiene facilities and practice.
  13. Medical surveillance, including medical removal procedures.
  14. Sampling, testing and analytical methods to include personnel air sampling requirements of 29 CFR Part 1926.62, wipe sampling of the surface where the LBP was removed and, when required, toxicity characteristic leaching procedure (TCLP) testing of the waste material in accordance with 40 CFR 261 and 6 NYCRR Part 371, and area air sampling required by the specifications. Procedures must include frequency, locations, sampling and analytical methods to be used.
- E. Compliance Program  
Contractor's Compliance Program prepared in accordance with 29 CFR Part 1926.62 (e) (2).
- F. Waste Transporter and Disposal Facility Permits, and Disposal Documents.
1. Name, address and telephone number of 6 NYCRR Part 364 transporter who will be transporting the LBP wastes and debris and a copy of the transporter's 6 NYCRR Part 364 permit.
  2. Name, address and telephone number of disposal facility accepting the LBP wastes and debris and a copy of the permit from the disposal facility documenting the facility is permitted to accept the wastes being delivered.
  3. Copy of completed waste characterization (waste profile) forms for obtaining approval to dispose of the LBP wastes and liquid wastes at the disposal facility.
  4. Copy of the approved waste characterization (waste profile) forms from the disposal facility indicating they are permitted to accept the wastes and will accept the wastes being delivered.
  5. Example of completed transportation and disposal documents (i.e., bill of lading or hazardous waste manifest and land disposal restriction notification forms, as applicable) prior to shipment of wastes.
  6. Copy of the completed and signed transportation and disposal documents at time of shipment for the disposal of LBP wastes and debris, liquid wastes and any other wastes generated, and copy signed by the disposal facility.
  7. Copy of certificate of destruction for incinerated wastes, certificate of treatment and/or certificate of disposal, as applicable and associated tracking documents from the final disposal facility for disposal of the LBP wastes and debris.
- G. Health and Safety Plan And Confined Space Entry Program  
Contractor's written site specific Health and Safety Plan prepared in accordance with 29 CFR Part 1910.120 and Contractor's confined space entry program prepared in accordance with 29 CFR Part 1910.146. These documents are requested for information only and as documentation that they exist.

- H. Sampling and Laboratory Analysis Reports  
Submit field sampling logs for all personal and area air samples, wipe samples and waste samples taken, and submit copy of laboratory analysis reports and chain of custody records for all sample analysis.
- I. Competent person certification per Section 3.5.B.

## 1.6 POSTED WARNINGS & NOTICES

The following regulations, warnings and notices shall be posted at the work site in accordance with 29 CFR Part 1926.62.

- A. Regulations  
A copy of applicable Federal, state, and local regulations shall be maintained at the work site.
- B. Warning Signs  
Warning signs shall be provided at approaches to LBP control areas. Signs shall be located at a distance from the LBP control areas that will allow personnel to read the sign and take the necessary protective actions required before entering the LBP control area. The signs shall comply with the requirements of 29 CFR Part 1926.62.
- C. Worker Information  
Right-to-know notices shall be placed in clearly visible areas of the work site in compliance with Federal, State and Local regulations.
- D. Air Monitoring Results  
Daily air monitoring results shall be prepared in order to be easily understood by the workers and shall be placed in a clearly visible area of the work site.
- E. Emergency Telephone Numbers  
A list of telephone numbers shall be posted at the site. The list shall include numbers of the local hospital, emergency squad, police and fire departments, Government and Contractor representatives who can be reached 24 hours per day and professional consultants directly involved in the project.

## 1.7 EQUIPMENT & MATERIALS

Sufficient quantities of health and safety materials required by 29 CFR Part 1926.62, and other materials and equipment needed to complete the project, shall be available and kept on the site.

- A. Respirators  
Air-purifying respirators shall be approved by NIOSH for use with dust, fumes and mists having permissible exposure limits less than 0.05 milligrams per cubic meter (i.e., have high-efficiency particulate air (HEPA) filters) and for other hazardous airborne contaminants that may be encountered, as determined by the Competent Person. The Contractor shall furnish, at no cost to personnel/employee, respirators to provide protection from airborne concentrations of lead. Respirators shall comply with the requirements of 29 CFR Part 1926.62 and shall be used in accordance with 29 CFR Part 1926.62, 29 CFR Part 1926.103 and 29 CFR Part 1910.134.
- B. Respirator Cartridges  
A sufficient supply of respirator cartridges shall be maintained at the work site to provide new cartridges to employees and authorized visitors, throughout the duration of the project. Cartridges shall be replaced according to the manufacturer's recommendations, when breathing becomes difficult, or if the cartridge becomes wet.

### C. Protective Clothing

1. The Contractor shall furnish, at no cost to personnel/employee, equipment/ clothing for protection from airborne and waterborne LBP debris. An adequate supply of these items shall be available for worker and authorized visitor use. Workers and visitors shall not take protective clothing and equipment off the work site at any time. Protective clothing includes:
  - a. Coveralls (Whole Body Protective Coverings): Full-body coveralls and head covers shall be worn by workers in the work area as necessary. Sleeves shall be secured at the wrist and pants legs at the ankle with tape. Permeable clothing shall be provided in heat-stress conditions. Where non-disposable coveralls are provided, these coveralls shall be cleaned after each wearing. Cleaning of coveralls and other non-disposable clothing shall be in accordance with the provisions for cleaning in 29 CFR Part 1926.62.
  - b. Boots: Work boots with nonskid soles or impermeable work boot covers shall be worn by workers. Where required by OSHA, safety boots (steel toe or steel toe and shank) shall be worn. Paint the uppers of boots red with waterproof enamel. Do not allow boots to be removed from the work area for any reason after being contaminated with LBP debris. Dispose of boots as LBP contaminated waste at the end of the work.
  - c. Gloves: Inner gloves, appropriate for items and hazards encountered and disposable outer work gloves shall be provided to each worker and shall be worn while the worker is in the work area. Glove material shall be appropriate for the specific chemical exposure. Gloves shall not be removed from the work area and shall be disposed of as LBP contaminated waste at the end of the work.
  - d. Hard Hats: Head protection (hard hats) shall be provided as required by OSHA for workers and authorized visitors. Protective plastic-strap suspension hats shall be used. Hard hats shall be worn at all times that work is in progress. Hats shall remain in the work area until the project is completed. Hats shall be thoroughly cleaned, decontaminated and bagged before being removed from the work area at the end of the project.
  - e. Eye Protection: Fog-proof goggles for personnel engaged in LBP operations shall be worn when the use of a full-face piece respirator is not required.

### D. Negative Air Pressure System

When a LBP control area requires the use of an airtight containment barrier, a negative air pressure system shall be used and pressure differential recordings taken. LBP shall not be removed from the LBP control area until the proper engineer controls and HEPA filtration systems are in place.

#### 1. HEPA Filter Requirements

The negative air pressure system shall be equipped with approved HEPA filters per UL 586. Negative air pressure equipment shall be equipped with new HEPA filters, and shall be sufficient to maintain a minimum pressure differential of minus 5 Pa (0.02 inch) of water column relative to adjacent, unsealed areas. Negative air pressure system minimum requirements are listed below.

- a. The unit shall be capable of delivering its rated volume of air with a clean first stage filter, an intermediate filter and a primary HEPA filter in place.

- b. The HEPA filter shall be certified as being capable of removing particles as small as 0.3 micrometers at a minimum efficiency of 99.97 percent.
- c. The unit shall be capable of continuing to deliver no less than 70 percent of rated capacity when the HEPA filter is 70 percent full or measures 620 Pa (2.5 inches of water) static pressure differential on a magnehelic gauge.
- d. The unit shall be equipped with a manometer-type negative pressure differential monitor with minor scale division of 0.02 inch of water and accuracy within plus or minus 1.0 percent. The manometer shall be calibrated daily as recommended by the manufacturer. Record manually manometer readings of the pressure differential between the LBP control area and adjacent unsealed areas at the beginning of each workday and every 2 working hours thereafter.
- e. The unit shall be equipped with a means for the operator to easily interpret the readings in terms of the volumetric flow rate of air per minute moving through the machine at any given moment.
- f. The unit shall be equipped with an electronic mechanism that automatically shuts the machine off in the event of a filter breach or absence of a filter.
- g. The unit shall be equipped with an audible horn that sounds an alarm when the machine has shut itself off.
- h. The unit shall be equipped with an automatic safety mechanism that prevents a worker from improperly inserting the main HEPA filter.
- i. The unit shall be ducted through the containment barrier wall to the outside of the work area. The unit shall not be exhausted into any work area.

2. Number of Units Required

The air within the containment barrier shall be changed at least once every 15 minutes by a continuously operating negative air pressure system, until the LBP control area barrier is removed. Filters shall be replaced as necessary to maintain the efficiency of the system. A back-up unit shall be maintained onsite.

3. Auxiliary Generator

An auxiliary generator shall be provided with a capacity adequate to power a minimum of 50 percent of the negative air machines at any time during the work. When power fails, the generator controls shall automatically start the generator and switch the negative air machine to generator power. The generator shall not present a carbon monoxide hazard to workers.

4. Discontinuing Negative Air Pressure System

The negative air pressure system shall not be shut down during LBP work unless authorized by the Owner's Consultant. At the completion of the LBP work procedures and disposal project, units shall be run until full cleanup has been completed and wipe clearance samples have been collected, analyzed and have passed final clearance testing requirements. Dismantling of the negative air pressure systems shall conform to the written decontamination procedures. Prefilters shall be removed and properly disposed. The intake to the machines shall be sealed with polyethylene to prevent environmental contamination.

E. Expendable Supplies

1. Polyethylene Sheet and Bags - General  
Polyethylene sheet and bags shall be minimum 6-mil thick. Bags shall have pre-printed labels, and 5-inch (minimum) long plastic ties, pointed and looped to secure the filled bags. Polyethylene sheets shall be in roll sizes to minimize seams.
2. Polyethylene Sheet - Flame Resistant  
Where a potential for fire exists, flame-resistant polyethylene sheets shall be provided. Polyethylene film shall conform to the requirements of NFPA 701.
3. Polyethylene Sheet - Reinforced  
Reinforced polyethylene sheet shall be provided where high skin strength is required such as where it constitutes the only barrier between the LBP control area and the outdoor environment. The sheet stock shall consist of translucent, nylon-reinforced or woven-polyethylene thread laminated between two layers of polyethylene film. Film shall meet flame resistant standards of NFPA 701.
4. Tape and Adhesive Spray  
Tape and adhesive shall be capable of sealing joints between polyethylene sheets and for attachment of polyethylene sheets to adjacent surfaces. After dry application, tape or adhesive shall retain adhesion when exposed to wet conditions, including amended water. Tape shall be minimum 2 inches wide, industrial strength.
5. Containers  
DOT approved impermeable containers shall be used to receive and retain LBP waste and debris, and lead contaminated material until disposal. Containers shall be labeled in accordance with EPA, DOT and OSHA standards.
6. Chemicals  
Chemicals, including caustics and paint strippers, shall be properly labeled and stored in leak-tight containers.

F. Vacuum Systems

HEPA filtered vacuum systems shall be used during LBP operations which generate dust. The systems shall be suitably sized for the project, and filters shall be capable of removing particles as small as 0.3 micrometers at a minimum efficiency of 99.97 percent.

G. Heat Blower Guns

Heat blower guns shall be flameless, electrical, paint-softener type with controls to limit temperature to 590 degrees C (1,100 degrees F). Heat blower shall be DI (non-grounded) 120 Vac, and shall be equipped with cone, fan, glass protector and spoon reflector nozzles.

H. Chemical Paint Strippers

Chemical paint strippers shall contain no methylene chloride.

I. Chemical Paint Stripper Neutralizer

Neutralizers for paint strippers shall be compatible with the substrate and suitable for use with the chemical stripper that has been applied to the surface.

## 1.8 STORAGE OF MATERIALS

Materials shall be stored in a place and manner, which protects them from damage and contamination. During periods of cold weather, plastic materials shall be protected from the cold. Regularly inspect materials to identify damaged or deteriorating items. Damaged or deteriorated

items shall not be used and shall be removed from the site as soon as they are discovered. Stored materials shall not present a hazard or an inconvenience to workers, visitors and/or other employees.

## **PART 2 – PRODUCTS**

(NOT APPLICABLE)

## **PART 3 – EXECUTION**

### **3.1 WORK PROCEDURES**

LBP work procedures and related work shall be performed in accordance with the U.S. Department of Housing and Urban Development “Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing” and the accepted Contractor’s LBP Management Plan. Procedures and equipment required to limit occupational and environmental exposures to lead during LBP removal shall be in accordance with 29 CFR Part 1926.62 and as specified herein. LBP waste and debris, lead contaminated debris and personal protective clothing and equipment shall be disposed of in compliance with Federal, state, and local regulations.

#### **A. Personnel Protection Procedures**

Personnel shall wear and use protective clothing and equipment as specified and required by 29 CFR Part 1926.62 and 29 CFR Part 1910.120. Eating, smoking, drinking, chewing tobacco and chewing gum, and applying makeup shall not be permitted in the LBP control area. Personnel of trades not engaged in the LBP work procedures and disposal of LBP shall not be exposed at any time to airborne concentrations of lead equal to or in excess of 30 micrograms per cubic meter of air. Electrical service shall be disconnected when wet removal is performed, and temporary electrical service protected by a ground fault circuit interrupter shall be provided.

#### **B. Safety and Health Procedures**

The Competent Person shall be present on the work site throughout the LBP project to supervise, monitor and document the project’s health and safety provisions. A daily log shall be maintained showing the results of sampling tests throughout the project area. LBP work being conducted within a LBP Control area where an airtight barrier is required shall be stopped if measured airborne lead concentrations, collected during LBP work procedures, exceed the pre- LBP work procedures airborne concentration levels.

#### **C. Safety and Health Responsibilities**

The Competent Person shall:

1. Verify that training meets applicable requirements.
2. Review and approve LBP Management Plan for conformance to the applicable referenced standards.
3. Inspect LBP removal work for conformance with the accepted LBP Management Plan.
4. Ensure that worker exposure air monitoring activities are in accordance with 29 CFR Part 1926.62.
5. Ensure work is performed in strict accordance with specifications.
6. Ensure hazardous exposure to personnel and to the environment are adequately controlled.

7. The Contractor's Competent Person shall be responsible for directing personal air monitoring.
  8. The Owner's Consultant shall be responsible for directing area and final air/wipe testing.
- D. **Medical Surveillance Procedures**  
Medical surveillance shall be implemented in accordance with the accepted Contractor's LBP Management Plan, and shall comply with the requirements of 29 CFR Part 1926.62, including the provisions for biological monitoring, medical removal, protection and a physician's written opinion, signed by the physician performing the employee examination. The Contractor shall provide a copy of the written opinion for Contractor's employees prior to each employee's commencement of work.
- E. **Engineering Controls and Containment Structures**  
Engineering and work practice controls are the primary means of maintaining exposures to lead below the PEL. Paint removal and surface preparation activities must keep dust levels at a minimum. Torch cutting of surfaces with LBP will require appropriate personal protective equipment and exposure controls. Power tools must be equipped with vacuum shrouds including a high efficiency particulate air filtered vacuum system attached.
1. **LBP Control Area**  
The LBP control area is where LBP work procedures occur and as such shall be considered contaminated. The LBP control area shall be isolated to prevent LBP containing dust or debris from passing into adjacent open areas. The control area shall be decontaminated at the completion of the LBP work procedure and disposal work.
  2. **Boundary Requirements.**  
Physical boundaries shall be provided around exterior LBP control areas by roping off the area indicated in the LBP Management Plan.
  3. **Control Barriers**  
The LBP control area shall be designated and separated from other outside areas with control barriers. The polyethylene sheeting shall have all openings masked and sealed. The LBP control area shall be erected according to the Contractors LBP Management Plan. Polyethylene sheeting shall be mechanically supported, independent of duct tape or spray adhesive.
  4. **Masking and Sealing**
    - a. **Exterior LBP control area requirements:** Where the construction of a contained LBP control area is impractical or not required based on the method of lead work procedures, a roped-off perimeter shall be installed 20 feet from and around the area where the LBP handling procedures are performed and other requirements for LBP control areas shall be maintained. Personal monitoring of airborne concentrations shall be conducted in adjacent areas during the work shift, in accordance with 29 CFR Part 1926.62. Area air monitoring inside and outside of the roped-off perimeter shall be conducted as specified. Airborne concentrations shall not exceed specified levels.
  5. **Personnel Decontamination Unit**  
Personnel decontamination units shall be provided when required for the LBP procedures. Materials fabricated or delivered to the site before the shop drawings have been returned to the Contractor will be subject to rejection by the Owner's Consultant. Specifications and drawings of portable prefab units, such as a trailer unit, if utilized, must be submitted for review and approval before start of construction. Submittal

shall include, but not be limited to, a floor plan layout showing dimensions, materials, sizes, thickness, plumbing, and electrical outlets. Access between contaminated and uncontaminated areas shall be through an airlock. Access between any two rooms or room and trailer within the decontamination unit shall be through a plastic sheeting curtained doorway. A separate equipment decontamination unit shall be provided. Each work area shall have an emergency exit. The personnel decontamination unit's clean room shall be the only means of entrance and exit, except for emergencies, from the LBP control area. Materials shall exit the LBP control area through the equipment decontamination area.

6. Clean Room

The clean room shall have only one exit to non-contaminated areas of the site. An airtight seal shall be constructed of polyethylene between the clean room and uncontaminated areas. Surfaces of the clean room shall be protected with sheet polyethylene. A temporary unit with a separate equipment decontamination locker room and a clean locker room shall be provided for personnel who are required to wear whole body protective clothing. One locker shall be provided in each locker room for each LBP worker, and each Contractor's representative. Lead-free personal clothing and shoes shall be kept in the clean locker. Hand wash station/showers shall be located between the equipment decontamination locker room and the clean locker room, and employees shall wash or shower before changing into personal clothes. An adequate supply of clean disposable towels shall be provided. LBP contaminated work clothing shall be cleaned. Clean rooms shall be physically attached to the LBP control area for areas inside the building but may be directly adjacent to the LBP control area outside of the building. Joint use of this space for other functions, such as offices, equipment storage, etc., is prohibited.

7. Hand Wash Station/Shower Room

An operational shower and hand washing station shall be provided between the work area and the clean changing room. Workers shall wash and/or shower before entering the clean changing room. Shower room shall be separated from other rooms by airtight walls fabricated from polyethylene sheeting. Water shall be hot and cold or warm. Shower heads/ controls, soap dish, continuing supply of soap, and clean towels shall be provided. The shower shall be maintained in a sanitary condition. Waste water shall be pumped to drain and through waste water filters that meet state and/or local requirements. These filters shall be located inside the shower unit and filters shall be changed regularly. Spent filters shall be discarded as LBP contaminated waste.

8. Equipment Decontamination

The Equipment Decontamination Unit shall be used for removal of equipment and materials from the LBP control area, and shall include a wash room, holding room, and an enclosed walkway. The unit shall be constructed from wood framing material and polyethylene sheeting. Workers shall not enter or exit the LBP control area through the Equipment Decontamination Unit. A washdown station, consisting of an enclosed shower unit, shall be located in the work area outside the Wash Room. The washdown station shall be used to clean equipment, bags and containers. Bagged or containerized LBP wastes shall be passed from the work area and cleaned in the Wash Room. The Wash Room shall be separated from the work area by a polyethylene sheet flap. Wastewater shall be filtered and filters shall be changed as required for the shower unit and the Wash Room. Filters shall be disposed of as LBP contaminated wastes. The Holding Room shall be used as a drop location for bagged LBP passed from the Wash Room. This room shall be constructed so that bagged materials cannot be passed from the Wash Room through the Holding Room to the enclosed walkway. The walkway shall provide access to the Holding Room from outside the work area. The enclosed walkway shall be separated from the exterior by a single flap of polyethylene sheeting. The Contractor's equipment used for LBP work procedures

shall be decontaminated prior to its removal outside of the lead control area. The decontamination water shall be containerized, the containers labeled, the liquid sampled and analyzed in the laboratory for lead, and properly disposed of off-site according to applicable Federal, State and Local regulations. See Paragraph 3.5.C.2.

9. Maintenance of Decontamination Units

Barriers and polyethylene sheeting shall be effectively sealed and taped. Containment barriers shall be visually inspected at the beginning of each work period. Damaged barriers and defects shall be immediately repaired upon discovery. Smoke testing methods shall be used to test effectiveness of barriers when directed by the Owner's Consultant.

10. LBP Control Area Exiting Procedures

Personnel exiting a LBP control area shall perform the following procedures and shall not leave the work place wearing any clothing or equipment worn during the work day:

- a. HEPA vacuum all protective clothing before removing.
- b. Remove protective clothing in the decontamination room and place this clothing in an approved impermeable disposal bag.
- c. Wash or shower.
- d. Change to clean clothes prior to leaving the physical boundary designated around the lead-contaminated work site.

F. Temporary Utilities

1. Temporary equipment as necessary to provide adequate power, light, heat, and water shall be installed, as needed, to accomplish the LBP operations properly and safely. The Contractor shall maintain the security and maintenance of the utility system in the LBP control areas. In the event of a failure of any utility system, the Owner will not be responsible for any loss of time or other expense incurred by the Contractor. In addition to any site-specific temporary utility requirements, the Contractor shall provide:

- a. Back-flow protection on all water connections is required. Fittings installed by the Contractor shall be removed after completion of work with no damage or alteration to existing water piping and equipment.
- b. When applicable, heavy-duty abrasion-resistant hoses to provide water to each work area and decontamination area.
- c. A hot water heater, if necessary, to provide warm water to the decontamination showers.
- d. Electrical service to work areas. Electrical service shall comply with National Electric Code, State and Local requirements and UL standards. Warning signs shall be posted at power outlets, which are other than 110-120 volt power. Only grounded extension cords shall be used. Incandescent lamps and light fixtures shall be of adequate wattage to provide good illumination in LBP control areas.
- e. Temporary heating units, when needed, that have been tested and labeled by UL, FM, or another recognized trade association related to the fuel being consumed. Forced air or fan type units shall not be utilized inside a work area. Units shall have tip-over protection.

- f. Sufficient quantity of single-occupant, self-contained chemical toilets, properly vented and fully enclosed.

### 3.2 LEAD-BASED PAINT WORK PRACTICES (Use methods as applicable)

#### A. Component Removal:

Components shall be removed intact to the extent practicable. A 6-mil polyethylene drop cloth shall be placed on either side of the component, prior to its removal, to catch any paint chips that may become dislodged. The component shall be wrapped in a layer of 6-mil polyethylene for movement to the disposal container. Follow proper disposal requirements. The area around the component removal shall be wet wiped and HEPA vacuumed, including the tent enclosure. The polyethylene sheeting shall be carefully folded in on itself and placed in a 6-mil disposal bag. Containment debris shall be properly disposed of as lead-based waste.

Clearance will be performed as follows:

1. Visual Clearance - Determine that all required work has been completed. Look for settled dust, paint chips or debris in work area. If located, cleanings will commence until visual inspection locates no evidence of dust.
2. The Owner's Consultant shall perform Dust and/or Soil Sampling as outlined in the U.S. Department of Housing and Urban Development "Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing".

#### B. Chemical Stripping: Assumed Exposure (50 ug/m<sup>3</sup> - 500 ug/m<sup>3</sup>)

Chemical stripping, using an agent approved by the Owner's Consultant, followed by wet scraping is the preferred method of abatement for areas where torch cutting, welding and/or other hot-work will affect building components coated with lead-based paint or lead containing coatings. The specific stripping agent(s) proposed must be approved by the Owner. No chemical strippers containing methylene chloride shall be used by the Contractor on this project.

1. Horizontal surfaces directly below and at least 10' in a radial direction from the area where chemical stripping is to be performed shall be protected with 6-mil poly.
2. All LBP on specified surfaces shall be removed to the bare substrate. The job is not considered complete until the substrate is dry and free of paint, debris, and LBP residue.
3. LBP stripping agents shall be brushed or troweled on the designated surfaces, or otherwise applied in accordance with manufacturer's specifications. The minimum thickness of chemical stripping agent applied shall be 0.125 (1/8) inches or the manufacturer's recommendations.
4. Stripping agents shall not be applied to, nor be allowed to inadvertently penetrate, wood and/or other porous substrates.
5. The required dwell time for stripping will depend upon the ambient temperature, humidity, and thickness of LBP. If LBP is not completely removed following the initial application of stripper, a second application and wet scraping may be required.

6. Removed LBP shall not be deposited on the polyethylene containment surfaces, but shall be transferred directly into 6-mil polyethylene bags from the scraper. LBP shall be removed by wet scraping to the maximum extent feasible.
7. Any residue not removable by wet scraping shall be washed down to the bare metal substrate with a high-phosphate solution. LBP-contaminated wastewater shall be kept to a minimum using wet scrub brushes or sponges. These residues and disposable cleaning media shall also be directly transferred to the 6-mil polyethylene bags containing other LBP wastes. Free standing water shall be eliminated by use of a drying agent.
8. Clearance will be performed as follows:
  - a. Visual Clearance - Determine that all required work has been completed. Look for settled dust, paint chips or debris in work area. If located, cleanings will commence until visual inspection locates no evidence of dust.
  - b. The Owner's Consultant shall perform Dust and/or Soil Sampling as outlined in the U.S. Department of Housing and Urban Development "Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing".

C. Manual Demolition/Scraping/Cleaning: Assumed Exposure (50 ug/m<sup>3</sup> - 500 ug/m<sup>3</sup>)

Manual demolition, scraping, manual sanding and power tool cleaning with dust collection systems shall be performed in conjunction with engineering and work practice controls meeting the requirements of 29 CFR 1926.62(e)(1).

Seal openings of HVAC ductwork and other penetrations (doors, windows, etc.) within the Control Area with two layers of 6-mil polyethylene sheeting. For work on vertical surfaces, place a layer of 6-mil polyethylene sheeting below the area prior to manual demolition/scraping/ cleaning. The sheeting shall extend 5 ft. on either side of the work area, to catch any paint chips that may become dislodged.

Wet methods shall be used during manual scraping, manual sanding and power tool cleaning with dust collection systems. Local HEPA ventilation shall be utilized in conjunction with manual scraping, manual sanding and power tool cleaning with dust collection systems. In the case that local HEPA ventilation is not sufficient to control dust hazards, the Contractor shall be required to install engineering controls to meet requirements of Specification Section 1.8(D) "Negative Air Pressure System".

Removed LBP shall not be allowed to accumulate on surfaces within the Control Area, but shall be HEPA vacuumed or placed directly into 6-mil polyethylene bags. The Contractor shall maintain all surfaces as free as practicable of accumulated lead dust to prevent the dispersal of lead into the work place. LBP shall be removed by manual methods to the maximum extent feasible.

Debris shall be bagged in 6-mil polyethylene bags and secured in leak proof drums until TCLP testing is completed. Follow proper disposal requirements. The area around the surfaces subject to work shall be wet wiped and HEPA vacuumed, including the polyethylene sheeting. Upon clearance by the Owner's Consultant, the polyethylene sheeting shall be carefully folded in on itself and placed in a 6mil disposal bag. Containment debris shall be properly disposed of as lead-based waste.

Clearance will be performed as follows and as needed:

- a. Visual Clearance – determine that all required work has been completed. Look for settled dust, paint chips or debris in work area. If located, cleanings will commence until visual inspection locates no evidence of dust.
- b. The Owner’s Consultant shall perform Dust and/or Soil Sampling as outlined in the U.S. Department of Housing and Urban Development “Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing”.

D. Alternative Lead Work Procedures

1. Any Work Procedure other than the outline procedures above, shall be submitted to the Owner’s Consultant for approval prior to the start of the project. As there are many different components in differing areas of the building(s), it is impractical to address every potential lead work procedure. The intent of alternative lead work procedures shall be to maintain compliance with 29 CFR 1926.62 and maintain airborne concentrations of lead dust below the Action Level of 30 ug/dL of air.

### 3.3 MONITORING & CLEARANCE SAMPLING

During the entire LBP removal and disposal operations, the Owner’s Consultant shall be on-site directing the monitoring/sampling and inspecting the work to ensure that the health and safety requirements of this contract are satisfied.

A. Personnel Air Monitoring (Provided by the Contractor, as necessary)

1. Personnel air monitoring samples for airborne concentrations of lead shall be collected and analyzed in accordance with 29 CFR Part 1926.62. Results shall be reported in micrograms per cubic meter of air. The Competent Person shall use personal air monitoring results to determine the effectiveness of engineering controls, the adequacy of PPE and to determine if proper work practices are being employed. The Owner’s Consultant shall be notified if any personal air monitoring result equals or exceeds 30 micrograms per cubic meter of air. The Contractor shall take steps to reduce the concentration of lead in the air.

B. Area Air Monitoring (Provided by the Owner’s Consultant, as requested)

Airborne concentrations of lead shall be collected and analyzed in the laboratory. Results shall be reported in micrograms per cubic meter of air.

1. Pre-LBP work  
Pre- LBP work samples shall be collected in the following locations: 1) inside the lead control area, one upwind of the LBP work and two downwind of the LBP work procedure activities; and 2) outside the physical boundary (roped off) area, one upwind of the LBP work and two downwind of the LBP work activities. A total of six (6) samples. If work is performed inside the building, similar numbers of samples are to be positioned inside and outside the LBP containment area.
2. LBP Work  
The Competent Person shall collect area air samples on a daily basis during the duration of the LBP work. The samples shall be collected in the same location as the pre-work samples.
3. The area air samples shall be collected at 4 to 6 feet above grade, and using high volume air samplers.

4. The air samples shall be analyzed by NIOSH Method 7082 or method approved by Engineer.
5. Results  
The Contractor shall have the results of the area air monitoring within 24 hours after completion of the sampling. Results shall be reported in micrograms per cubic meter of air.
6. Excessive Levels  
Outdoor LBP work shall cease and the Owner's Consultant notified if measured airborne lead concentrations, collected during LBP activities, exceed the pre-work airborne concentration levels. The Contractor may be required to clean and re-sample the affected area, at no additional cost to the Owner, if directed by the Owner's Consultant. The Contractor shall correct the work practices and/or engineering controls and shall resume LBP work procedures at the direction of the Owner's Consultant.

C. Waste Sampling and Testing (Provided by the Contractor)

Sampling and testing of all waste, shall be in accordance with 40 CFR Part 261, 6 NYCRR Part 371 and SW-846, Chapter 9, Sampling Plan. See Paragraph 3.5.C of this specification section for waste sampling and analyses requirements.

D. Soil Sampling (Provided by the Owner, as requested)

1. If the Owner's Consultant or Owner's representative observes paint chips or LBP debris on the surface of the soil surrounding the work area during the LBP work procedures or at completion or if the Owner's Consultant or IH/ Owner's Representative suspects potential contamination to the soil based on observed procedures and conditions during the work, the contractor shall pay for composite soil samples of the surface soil where designated by the Owner's Consultant and at a frequency specified by the Owner's Consultant. Two Background surface soil samples will be collected where directed by the Owner's Consultant. The samples shall be analyzed by an independent laboratory for lead on a total basis (by EPA Method 6010) and TCLP basis (Extraction Method 1311, analysis by EPA Method 6010).
2. Standard Soils Clearance samples shall be collected by the Owner's Consultant and paid for by the Owner. The samples shall be analyzed by an independent laboratory for lead on a total basis (by EPA Method 6010) and TCLP basis (Extraction Method 1311, analysis by EPA Method 6010).
3. If the analyses exceed the TCLP limit, the soil shall be treated as LBP contaminated waste, excavated and disposed of as a hazardous waste by the Contractor.

Clearance Level (Subject to Change):

Soil: 400 microgram per gram

E. Dust/Wipe Sampling (Provided by the Owner, as necessary)

1. Dust/wipe samples shall be taken no sooner than 24 hours after abatement activities, including clean-up activities, have been completed.
2. Sampling for clearance criteria shall be performed as detailed in the HUD Guidance document. Appendices 13 and 14.

3. Failure to clear the work area and recleaning shall be the responsibility of the Contractor. The work area shall remain in place until satisfactory clearance has been achieved.
4. Analysis of Dust/Wipe samples for areas, which failed previous Dust/Wipe sampling, shall be reimbursed by the Contractor.

Clearance Levels:

Floors:	40 micrograms per square foot
Window Sills:	250 micrograms per square foot
Window Wells:	400 micrograms per square foot

### **3.4 ADJACENT AREAS**

Damage to adjacent areas shall be repaired to the approval of the Owner.

### **3.5 CLEAN-UP & DISPOSAL**

#### **A. Cleanup**

1. **Daily**  
Surfaces in the LBP control area shall be maintained free of accumulations of paint chips, LBP debris, blasting debris and dust. Spread of dust and debris shall be restricted; waste shall not be distributed over the work area. Dry sweep or compressed air shall not be used for cleanup. At the end of each shift, the area shall be cleaned of visible lead paint contamination by vacuuming with a HEPA filtered vacuum cleaner and wet wiping the area. LBP work procedures work shall cease during the cleanup.
2. At Completion of LBP work Procedure and a satisfactory visual inspection by the Engineer, a clean-up shall be performed by the Contractor. This clean-up includes removal of any contaminated material, equipment or debris including polyethylene sheeting from the work area. The polyethylene sheeting shall be sprayed or misted with water for dust control, construction debris removed and then the sheeting removed by folding it in upon itself.
  - a. Lead-contaminated debris shall be containerized in accordance with paragraph 3.5.C.1, LBP Wastes and Lead-Contaminated Wastes. Waste bags shall not be overloaded, shall be securely sealed and stored in the designated area until disposal.
  - b. Removal of surface polyethylene sheeting shall begin from top to bottom. Removal of floor polyethylene sheeting shall begin at the corners and folded in the middle to contain the dust. Polyethylene shall be disposed of as specified in Paragraph 3.5.C.1
  - c. Cleaning Equipment. The Contractor shall decontaminate the lead abatement equipment and equipment used in the work area. The wastewater from cleaning shall be contained, sampled and disposed of as specified in Paragraph 3.5.C.2.

B. Certification

The Contractor shall certify in writing that the inside and outside the lead control area air monitoring samples are less than 30 micrograms per cubic meter of air, the respiratory protection for the employees was adequate, the work procedures were performed in accordance with 29 CFR Part 1926.62 and that there was no visible accumulations of lead-based paint and dust on the worksite. Do not remove warning signs at the lead control area or roped-off boundary signs prior to the Owner's Consultant's receipt of the Contractor's certification. Re-clean areas showing dust, residual paint chips. LBP debris and blasting debris.

Waste Storage, Sampling/Analysis and Disposal (Provided by the Contractor)

1. LBP Wastes and Lead-Contaminated Water,

LBP waste, and lead-contaminated waste and debris shall be stored sampled and analyzed and disposed of as follows.

- a. The LBP waste and debris, lead contaminated personal protective equipment (PPE), clothing and waste polyethylene and lead-contaminated waste and debris shall be containerized in DOT approved containers (i.e.. 55 gallon drums, roll-off, etc.). If the waste is placed in roll-off(s), the roll off shall be lined with a minimum of 2 layers of 6-il polyethylene prior to placing any waste in it and covered with a liquid tight cover. Each container shall be labeled to identify the type of waste as defined in 49 CFR Part 172, 6 NYCRR Part 371 and 6 NYCRR Part 360 and with the date lead contaminated wastes were first put into the container.
- b. A representative sample of the container(s) of LBP wastes and lead-contaminated wastes and debris generated by the LBP activities shall be taken in accordance with SW-. 846, Chapter 9, Sampling Plan and analyzed in the laboratory for TCLP lead by EPA Methods 1311 (extraction) and 6010 (analysis). If the wastes are placed in roll-off(s), four (4) composite samples per roll-off shall be taken for analysis. If the wastes are placed in 55 gallon drums, one composite sample for every ten (10) drums of wastes shall be taken for analysis. The laboratory analyses results shall dictate the proper method of disposal of the waste. A copy of the results shall be attached to the waste characterization (waste profile) form.
- c. A waste characterization (waste profile) form shall be completed for the LBP waste and lead-contaminated waste and debris, and lead contaminated personal protective equipment and clothing (if containerized separately) and the forms submitted to Owner's Consultant for approval The Owner shall sign the forms. The Contractor shall process the forms and forward to the disposal facility for approval. The approved waste profile forms from the disposal facility shall be submitted to the Owner and Engineer prior to shipment of the wastes off-site.
- d. The applicable waste transportation and disposal documents (i.e., hazardous waste manifest, bill of lading, non-hazardous waste manifest, land disposal restriction notification, etc.) shall be obtained and completed. An example of the completed waste transportation and disposal documents shall be submitted to Owner's Consultant for approval prior to shipment of the waste off-site.
- e. Pick-up of hazardous wastes shall be made as needed to ensure that containers do not remain on the work site longer than 90 calendar days from the date affixed to each container. The Owner will assign an area for interim storage of waste-containing containers.

- f. Lead contaminated personal protective equipment/ clothing, lead contaminated polyethylene, filters and debris, which cannot be sampled, shall be handled, stored, transported, and disposed of in the same manner as the LBP wastes and lead-contaminated wastes and debris, based on the sampling, laboratory analyses results and SW-846, Chapter 9, Sampling Plan calculations performed on the LBP wastes and lead-contaminated wastes and debris.
- g. The LBP and lead contaminated wastes/ debris shall be handled, stored, transported and disposed of in accordance with 40 CFR Parts 260 to 265, 6 NYCRR Par 370 to 373, 6 NYCRR Part 364 and 6 NYCRR Part 360, as applicable. Additionally, the disposal shall be based on the sampling, laboratory analysis results and SW-846, Chapter 9, Sampling Plan calculations. Land disposal restriction notification shall be as required by 40 CFR Part 268 and 6 NYCRR Part 376.

## 2. Wastewater and Decontamination Water

- a. Lead contaminated wastewater and decontamination water generated from the LBP work procedures shall be stored in DOT approved 55 gallon drums. Each drum shall be labeled to identify the type of waste as defined by 49 CFR Part 172, 6 NYCRR Part 371 and 6 NYCRR Part 360 and with the date lead contaminated liquid was first put into the drum.
- b. A representative sample from the drum(s) of liquid wastes shall be taken in accordance with SW-846, Chapter 9, Sampling Plan and analyzed in the laboratory for total lead and total cadmium by EPA Method 200.7/6010. One composite sample for every ten (10) drums of liquid wastes shall be taken for analysis. The laboratory analyses results shall dictate the proper method of disposal of the waste. A copy of the results shall be attached to the waste characterization (waste profile) form.
- c. A waste characterization (waste profile) form shall be completed for the liquid wastes and other wastes being generated and submitted to Owner's Consultant for approval. The Owner shall sign the form(s). The Contractor shall process the form(s) and forward the forms to the disposal facility for approval. The approved waste profile form(s) from the disposal facility shall be submitted to the Owner and Engineer prior to shipment of the wastes off-site.
- d. The applicable waste transportation and disposal documents (i.e., hazardous waste manifest, bill of lading, non-hazardous waste manifest, land disposal restriction notification, etc.) shall be obtained and completed. An example of the completed waste transportation and disposal documents shall be submitted to Owner's Consultant for approval prior to shipment of the waste off-site.
- e. The lead contaminated wastewater and decontamination water shall be handled, stored, transported and disposed of in accordance with 40 CFR Parts 260 to 265, 6 NYCRR Part 370 to 373, 6 NYCRR Part 364 and 6 NYCRR Part 360 as applicable.

## 3. Waste Pick-Up and Disposal

- a. Waste pick-up cannot be performed until all required submittals have been reviewed and approved by the Owner's Consultant. The Owner must be present at waste pick-up to sign the waste transportation documents and

- approve pick-up. No waste shall leave the site without approval and authorization by Owner.
- b. Coordinate scheduling of waste pick-up and transportation with Owner's Consultant. Notify Engineer at least 48 hours ahead of when the waste pick-up will take place.
- c. All wastes shall be properly disposed of off-site at an approved disposal facility. The wastes shall be transported by a transporter permitted to transport wastes per 6 NYCRR Part 364. The wastes shall be disposed of at a facility permitted to accept the waste being disposed of.
- d. Submit copy of completed and signed transportation and disposal documents to Owner and Engineer at time of shipment and submit copy of document signed by the disposal facility.
- e. Return or cause to be returned all waste manifests and bills of lading signed by the disposal facility within fifteen (15) days of removal from the project site.
- f. Submit certification of destruction for all incinerated wastes and certificates of final treatment and/or final disposal, as applicable, for all wastes disposed of off-site.
- g. All waste transportation and disposal must be conducted in accordance with all applicable State, Local and Federal regulations, all generator State regulations, all the State regulations where the wastes are transported through, and the disposal State regulations.

C. Payment for Disposal of Wastes

Payment for disposal of wastes will not be made until the following are received by the Owner:

1. A signed copy of the manifests
2. Bills of lading
3. Weight tickets, etc.
4. Certificate of final disposal, from the final treatment or disposal facility certifying the amount of lead containing wastes and debris delivered.

**PART 4 – INSPECTION**

**4.1 SUMMARY OF INSPECTION**

Quality Environmental Solutions & Technologies, Inc. (QuES&T) was retained by Mount Pleasant CSD to complete a Pre-Demolition XRF Inspection for Lead-Based Paint(s), and/or Lead-containing materials, utilizing X-ray Fluorescence Technology (XRF) throughout (inactive) building at 825 Westlake Drive, Thornwood NY 10594.

This report should be read in its entirety, including the detailed information and XRF data tables contained in other sections and appendices.

The XRF Lead Survey conducted throughout accessible, interior demolition areas, mentioned above, located at 825 Westlake Drive, Thornwood NY 10594, and was conducted by Niton-certified XRF Technician Mr. Jonathan Mages, of QuES&T, on February 19<sup>th</sup>, 2020. The survey included accessible interior building components and immovable objects to identify the presence of Lead-Based Paint (LBP) and/or Lead-containing Materials in compliance with the HUD/EPA Guidelines potentially affected by

Mount Pleasant CSD/Physical  
Education Department Renovations  
at Westlake High School  
NYSER # 66-08-01-06-0-005-020

028300-25

#4.1449.08

scheduled renovation/demolition work. No prior sampling, data or documentation was utilized as part of the survey. All surfaces were located and categorized by homogeneous painting histories and component types. A total of thirty-nine (39) samples were taken (including calibrations).

Two locations were identified as having lead-based paints above the EPA/HUD thresholds.

This report has been prepared for the exclusive use of Mount Pleasant Central School District.

A summary of results above the EPA action level of 1.0 mg/sq. cm., has been included in order to aid prospective bidders.

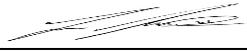
## 4.2 SUMMARY OF RESULTS ABOVE THE EPA/HUD ACTION LEVEL

### 4.2.1 IDENTIFIED LEAD-BASED PAINT(S)

<u>Location of Identified LBP</u>	<u>LBP Component</u>	<u>Substrate</u>	<u>Color</u>	<u>LBP Condition</u>
Boy's Locker Room, Back Room	Wall, Floors	Ceramic Tile	Yellow	Intact
Boy's Locker Room, Closet	Slop Sink	Metal	White	Fair

- Additionally, it should be noted that a few components tested did in fact contain minimal lead levels, below the EPA threshold level of 1.0 mg/sq. cm. for classification as Lead-Based Paint (LBP) and are considered lead-containing coatings by the OSHA Regulation, "Lead Exposure in Construction" (29 CFR 1926.62). OSHA does not recognize a minimum limit for lead concentrations in paint for the purposes of disturbance. Monitoring of workers performing demolition/cleaning/disturbance of painted surfaces shall be completed to document personnel occupational exposure. Items containing any amount of lead concentration are considered lead-containing coatings per 29 CFR 1926.62, OSHA Lead Exposure in Construction.

Inspection findings reviewed & approved by:

Louis N. Johnson III   
EPA Lead Risk Assessor / Inspector  
Cert. #LBP-R-I151914-1 / #LBP-I-I151914-1

**END OF SECTION 02 83 00**

## SECTION 033000 – CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Formwork for cast-in-place concrete with shoring and bracing
2. Formwork accessories
3. Form stripping
4. Reinforcing steel for cast-place-concrete
5. Cast-in-place concrete including the following:
  - a. Foundations and footings
  - b. Foundation walls
  - c. Floor slabs
  - d. Retaining Walls
  - e. Equipment pads and bases
  - f. Steel pan stairs
  - g. Exterior stairs
6. Concrete curing.

#### 1.2 REFERENCES

A. General:

1. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the work. Where differences exist between codes and standards, the one affording the greatest protection shall apply.

B. American Concrete Institute (ACI):

1. ACI 117 Specification for Tolerances for Concrete Construction
2. ACI 211.1 Proportioning Concrete Mixtures
3. ACI 301 Specifications for Structural Concrete
4. ACI 303.1 Specification for Cast-in-Place Architectural Concrete
5. ACI 305 Hot Weather Concreting
6. ACI 306 Specifications for Cold Weather Concreting
7. ACI 308 Specifications for Curing Concrete
8. ACI 309 Consolidation of Concrete
9. ACI 318 Building Code Requirements for Structural Concrete

### 1.3 SUBMITTALS

- A. Product Data: Provide data for proprietary materials, including admixtures curing materials, and finish materials.
- B. Submit Placement Shop Drawings, showing location of construction joints. Clearly indicate the construction joints in different locations that those shown in the drawings.
- C. Samples: As requested by testing laboratory.
- D. Mix design for each concrete mix.
- E. Include compression test data used to establish mix proportions.
- F. Submit certification that the facilities of the ready-mix plant comply with the requirements of ASTM C94.
- G. Material Certificates.
  - 1. Cementitious materials, including supplemental cementitious material.
  - 2. Aggregates, including gradation and combined gradation.
  - 3. Admixtures. Where more than one admixture is proposed, include statement from admixture manufacturer indicating that admixtures proposed for use are compatible, such that desirable effects of each admixture will be realized.
- H. Submit ticket to Testing Laboratory for each batch of concrete delivered.
  - 1. Mix identification.
  - 2. Weights of cementitious materials, aggregates, water and admixtures, and aggregate size.

### 1.4 QUALITY ASSURANCE

- A. Standards: Comply with provisions of ACI 301, except where more stringent requirements are indicated. Evaluation and acceptance of concrete structures will be in accordance with ACI 301.
- B. Concrete Mix Design: Submit proposed mix designs and test data before concrete operations begin. Identify for each mix submitted the method by which proportions have been selected. Each mix shall be identified as it will appear on batch tickets delivered to project site.
  - 1. For mix designs based on field experience, include individual strength test results, standard deviation, and required average compressive strength calculations.
  - 2. For mix designs based on trial mixtures, include trial mix proportions, test results, and graphical analysis and show required average compressive strength.
  - 3. Indicate quantity of each ingredient per cubic yard of concrete.
  - 4. Indicate type and quantity of admixtures proposed or required.

- C. Certificates of Compliance: Acceptability of the following materials will be based upon documentation furnished by the manufacturer identifying each batch of material and certifying compliance with the requirements specified:
  - 1. Portland cement.
  - 2. Fly ash.
  - 3. Chemical admixtures.
  
- D. Certified Laboratory Test Reports: Before delivery of materials submit certified copies of the reports of the tests required in referenced standards or otherwise specified here. The testing shall have been performed by an independent laboratory within one year of submittal of test reports for approval. Test reports on a previously tested material shall be accompanied by certificates from the manufacturer certifying that the previously tested material is of the same type, quality, manufacture and make as that proposed for use in the project. Certified test reports are required for the following:
  - 1. Portland Cement.
  - 2. Aggregates.
  - 3. Admixtures.
  
- E. Survey anchor bolts for placement and alignment prior to casting concrete.

#### 1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver reinforcement to project site bundled and tagged with metal tags, indicating bar size, lengths, and other data corresponding to information shown on placement drawings.
- B. Store concrete reinforcement materials at the site to prevent damage and accumulation of dirt or rust.
- C. Store cementitious materials in a dry, weathertight location. Maintain accurate records of shipment and use.
- D. Store aggregates to permit free drainage and to avoid contamination with deleterious matter or other aggregates. When stockpiled on ground, discard bottom 6 inches of pile.

#### 1.6 PROJECT CONDITIONS

- A. Cold-Weather Concreting: Comply fully with the recommendations of ACI 306.
  - 1. Well in advance of proposed concreting operations, advise the engineer of planned protective measures including but not limited to heating of materials, heated enclosures, and insulating blankets.
  
- B. Hot-Weather Concreting: Comply fully with the recommendations of ACI 305.
  - 1. Well in advance of proposed concreting operations, advise the engineer of planned protective measures including but not limited to cooling of materials before or during mixing, placement during evening to dawn hours, fogging during finishing and curing, shading, and windbreaks.

## PART 2 - PRODUCTS

### 2.1 FORMWORK

#### A. Facing Materials:

1. Unexposed finish concrete: Any standard form materials that produce structurally sound concrete.
2. Exposed finish concrete: Materials selected to offer optimum smooth, stain-free final appearance and minimum number of joints. Provide materials with sufficient strength to resist hydrostatic head without bow or deflection in excess of allowable tolerances.

#### B. Formwork Accessories:

1. Foam coating: Foam release agent that will not adversely affect concrete surfaces or prevent subsequent application of concrete coatings.
2. Metal ties: Commercially manufactured types; cone snap ties, taper removable bolt, or other type which will leave no metal closer than 1-1/2 inches from surface of concrete when forms are removed, leaving not more than a 1-inch-diameter hole in concrete surface.
3. Fillets: Wood or plastic fillets for chamfered corners, in maximum lengths possible.

### 2.2 REINFORCING MATERIALS

A. Reinforcing Bars: Provide deformed bars complying with ASTM A615, Grade 60, except where otherwise indicated.

B. Reinforcing Bar Mats: ASTM A184.

C. Welded Wire Fabric: ASTM A1064, cold-drawn steel, plain.

#### D. Reinforcing Accessories:

1. Tie wire: Black annealed type, 16-1/2 gage or heavier.
2. Supports: Bar supports conforming to specifications of CRSI "Manual of Standard Practice."
  - a. Class 1 (plastic protected) where legs of wire bar supports contact forms.
  - b. Precast concrete blocks of strength equal to or greater than specified strength of concrete or Class 3 supports equipped with sand plates, where concrete will be cast against earth. Concrete masonry units will not be accepted.

### 2.3 CONCRETE MATERIALS

A. Cementitious materials and aggregates for exposed concrete shall be from same source throughout the work.

- B. Cementitious Material: An intimate blend of Portland cement and supplemental cementitious material. Cementitious material shall include a maximum of 15 percent fly ash or ground blast furnace slag by weight unless the strength is specified to be achieved in 7 or 14 days. Cementitious material shall comply with ACI 318 Chapter 4 requirements for exposure class S1.
- C. Portland Cement: ASTM C150 and as follows:
  - 1. Type I except where other type is specifically permitted or required.
    - a. Type I can be replaced by Type III (high early strength) for concrete placed during cold weather.
- D. Supplemental Cementitious Materials:
  - 1. Fly Ash: ASTM C618, Class F with the following Modified ASTM requirements:
    - a. Loss of Ignition (L.O.I.): maximum 1 percent.
    - b. Sulfur Trioxide (SO<sub>3</sub>) shall not exceed 3 percent by weight.
  - 2. Ground Blast Furnace Slag: ASTM C989.
- E. Aggregates
  - 1. Normal weight concrete: ASTM C33.
    - a. Class S3
  - 2. Light weight concrete: ASTM C330.
  - 3. Maximum size of coarse aggregate, whichever is least:
    - a. One-fifth narrowest dimension between sides of forms.
    - b. Three-fourths of minimum clear distance between reinforcing bars or between bars and side of form.
    - c. Columns and piers: Two-thirds of minimum clear distance between bars.
- F. Water: Mixing water shall be clean, potable and free from deleterious material.
- G. Admixtures - General
  - 1. Admixtures containing more than 0.1 percent chloride ions are not permitted.
  - 2. Where mix contains more than one admixture, all admixtures shall be supplied by one manufacturer. Manufacturer shall certify that admixtures are compatible such that desirable effects of each admixture will be realized.
  - 3. Liquid admixtures shall be considered part of the total water.
- H. Water Reducing Admixture: ASTM C494, Type A. Provide in all concrete at necessary dosage to facilitate placement.
- I. Mid to High Range Water Reducing Admixture: ASTM C494, Type F; polycarboxylate formulation. Provide in mid-range or high-range dosage as necessary for placement at the maximum water to cement ratio specified.

- J. Set Accelerating Admixture: ASTM C494, Type E, non-chloride. Subject to approval of engineer, provide in necessary dosage to accelerate set.
- K. Set Retarding Admixture: ASTM C494, Type D. Subject to approval of engineer, provide in necessary dosage to retard set.
- L. Fibrous Reinforcement: Polypropylene fibers designed and engineered specifically for secondary reinforcement of concrete.

## 2.4 ACCESSORIES

- A. Curing Compounds: ASTM C309, Type 1 which will not discolor concrete or affect bonding of other finishes applied, and which restricts loss of water to not more than 0.500 grams per square centimeter of surface when tested per ASTM C156, "Test Method for Water Retention by Concrete Curing Materials."
- B. Bonding Compound: Non-redispersible acrylic bonding admixture, ASTM C1059, Type II.
- C. Slab Curing Membrane: Membrane conforming to ASTM C171, non-staining.
- D. Burlap Sheet: AASHTO M182, class 3 or 4.
- E. Vapor Barrier: ASTM D2103, "Polyethylene Film and Sheeting."
- F. Grout: ASTM C1107, Grade B non-shrink, non-metallic, prepackaged grout.
- G. Waterstops: Provide waterstops at construction joints and as otherwise indicated, sized and configured to suit joints.
- H. Expansion Joint Filler: Nonextruding bituminous type: ASTM D1751.

## 2.5 CONCRETE MIXES

- A. Proportioning of Concrete: Comply with recommendations of ACI 211.1.
- B. Required Average Strength: Establish the required average strength of the design mix on the basis of either field experience or trial mixtures as specified in ACI 301, and proportion mixes accordingly. If trial mixture method is used, employ an independent testing agency acceptable to the engineer for preparing and reporting proposed mix design.
- C. Specified compressive strength  $f'(c)$  at 28 days:
  - 1. Foundations and footings: 4000 psi.
  - 2. Walls, columns, suspended slabs, and beams: 4000 psi.
  - 3. Floor slabs on grade: 4000 psi
  - 4. Concrete fill on metal deck: 4000 psi.
  - 5. Miscellaneous curbs and pads: 4000 psi.
- D. Slump: The concrete mix design shall provide for a concrete slump appropriate to the project conditions. The concrete shall be sufficiently fluid to allow for ease of placement and sufficiently stiff to prevent segregation.

- E. Fibrous Reinforcement: Where specified or approved, add to mix at rate recommended by manufacturer for specific application.
  - 1. Add to concrete mix in lieu of providing welded wire fabric reinforcement for interior floor slabs, at contractor's option and with prior approval of engineer.
- F. Water to Cementitious Material Ratio: Water-to-cementitious-material ratio shall not exceed 0.45 by weight. Weight of water shall include all free moisture, including liquid admixtures.
- G. Air-entraining admixture: Use in mixes for exterior exposed concrete unless otherwise specifically indicated. Add at rate to achieve total air content of 6 percent. For concrete not exposed to exterior, add at rate to achieve total air content between 2 percent and 4 percent.
- H. Water-reducing admixture: Add as required for placement and workability.
- I. Water-reducing and retarding admixture: Add as required in concrete mixes to be placed at ambient temperatures above 90 degrees F.
- J. Water-reducing and accelerating admixture: Add as required in concrete mixes to be placed at ambient temperatures below 50 degrees F.
- K. High-range water-reducing admixture (superplasticizer): As required for placement and workability.
- L. Mix Adjustments: Provided that no additional expense to owner is involved, contractor may submit for approval requirements for adjustment to approved concrete mixes when circumstances such as changed project conditions, weather, or unfavorable test results occur. Include laboratory test data substantiating specified properties with mix adjustment requests.

## 2.6 CONTROL OF MIX IN THE FIELD

- A. Slump: A tolerance of up to 1 inch above approved design mix slump will be permitted for 1 batch in 5 consecutive batches tested. Concrete of lower slump than that specified may be used, provided proper placing and consolidation is obtained.
- B. Total Air Content: A tolerance of plus or minus 1 percent of approved design mix air content will be allowed for field measurements.
- C. Do not use batches that exceed tolerances.

## PART 3- EXECUTION

### 3.1 FORMWORK ERECTION

- A. General: Comply with requirements of ACI 301 for formwork, and as herein specified. The contractor is responsible for design, engineering, and construction of formwork, and for its timely removal.
- B. Earth forms: Hand trim sides and bottom of earth forms; remove loose dirt.

- C. Design: Design and fabricate forms for easy removal, without impact, shock, or damage to concrete surfaces or other portions of the work. Design to support all applied loads until concrete is adequately cured, within allowable tolerances and deflection limits.
- D. Construction: Construct and brace formwork to accurately achieve end results required by contract documents, with all elements properly located and free of distortion. Provide for necessary openings, inserts, anchorages, and other features shown or otherwise required.
  - 1. Joints: Minimize form joints and make watertight to prevent leakage of concrete.
    - a. Align joints symmetrically at exposed conditions.
  - 2. Chamfers: Provide chamfered edges and corners at exposed locations, unless specifically indicated otherwise on the drawings.
  - 3. Permanent openings: Provide openings to accommodate work of other trades, sized and located accurately. Securely support items built into forms; provide additional bracing at openings and discontinuities in formwork.
  - 4. Temporary openings: Provide temporary openings for cleaning and inspection in most inconspicuous locations at base of forms, closed with tight-fitting panels designed to minimize appearance of joints in finished concrete work.
- E. Tolerances for Formed Surfaces: Comply with minimum tolerances established in ACI 117, unless more stringent requirements are indicated on the drawings.
- F. Release Agent: Provide either form materials with factory-applied nonabsorptive liner or field-applied form coating. If field-applied coating is employed, thoroughly clean and recondition formwork and reapply coating before each use.

### 3.2 REINFORCEMENT AND EMBEDDED ITEMS

- A. Preparation: Clean reinforcement of loose rust and mill scale, soil, and other materials which adversely affect bond with concrete.
- B. Placement: Place reinforcement to achieve not less than minimum concrete coverage as required for protection. Accurately position, support, and secure reinforcement against displacement. Provide Class B tension lap splices complying with ACI 318 unless otherwise indicated. Do not field-bend partially embedded bars unless otherwise indicated or approved.
  - 1. Use approved bar supports and tie wire, as required. Set wire ties to avoid contact with or penetration of exposed concrete surfaces. Tack welding of reinforcing is not permitted.
  - 2. Wire fabric: Install in maximum lengths possible, lapping adjoining pieces not less than one full mesh. Offset end laps to prevent continuous laps in either direction, and splice laps with tie wire.
- C. Welding: Welding of reinforcement is not permitted.
- D. Installation tolerances for anchor bolts for structural steel columns shall comply with the AISC Code of Standard Practice for Steel Buildings and Bridges.

### 3.3 JOINT CONSTRUCTION

- A. Construction Joints: Locate and install construction joints as indicated on drawings. If construction joints are not indicated, locate in manner which will not impair strength and will have least impact on appearance.
  - 1. Keyways: Provide keyways not less than 1-1/2 inches deep.
  - 2. Reinforcement: Continue reinforcement across and perpendicular to construction joints, unless details specifically indicate otherwise.
  - 3. Waterstops: Provide waterstops as indicated, installing to form continuous, watertight dam, with field joints fabricated in strict accordance with manufacturer's instructions.
- B. Expansion Joints: Construct expansion joints where indicated. Install expansion joint filler to full depth of concrete. Recess edge of filler to depth indicated to receive joint sealant and backer rod where necessary.

### 3.4 PLACING CONCRETE

- A. The rate of delivery, haul time, missing time and hopper capacity shall be such that all mixed concrete delivered shall be placed in forms within 90 minutes from the time of the introduction of cement and water into the mixer.
- B. No water shall be added after transit mixer leaves the batching.
- C. Prepare previously placed concrete by cleaning and applying bonding agent in accordance with manufacturer's instruction.
- D. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with epoxy grout.
- E. Foundation surfaces against which concrete is to be placed must be free from standing water, mud and debris. Surfaces shall be clean and free from oil, objectionable coatings, and loose or unsound material.
- F. Placement in Forms: Limit horizontal layers to depths which can be properly consolidated, but in no event greater than 24 inches.
  - 1. Consolidate concrete by means of mechanical vibrators, inserted vertically in freshly placed concrete in a systematic pattern at close intervals. Penetrate previously placed concrete to ensure that separate concrete layers are knitted together.
  - 2. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregates.
  - 3. Do not use vibrators to move concrete laterally.
- G. Cold Weather Placement: Comply with recommendations of ACI 306 when air temperatures are expected to drop below 40 degrees F either during concrete placement operations or before concrete has cured.
  - 1. Do not use frozen or ice-laden materials.

2. Do not place concrete on frozen substrates.
- H. Hot Weather Placement: Comply with recommendations of ACI 305 when ambient temperature before, during, or after concrete placement is expected to exceed 90 degrees F or when combinations of high air temperature, low relative humidity, and wind speed are such that the rate of evaporation from freshly poured concrete would otherwise exceed 0.2 pounds per square foot per hour.
1. Do not add water to approved concrete mixes under hot weather conditions.
  2. Provide mixing water at lowest feasible temperature and provide adequate protection of poured concrete to reduce rate of evaporation.
  3. Use fog nozzle to cool formwork and reinforcing steel immediately prior to placing concrete.

### 3.5 FLOOR SLABS

- A. Place floor slabs on grade as indicated on drawings. Saw cut control joints at an optimum time after finishing. Cut slabs with a 3/16-inch (8 mm) thick blade to 1 inch (25 mm) depth. Locate control joints at a maximum spacing of 36 times the slab depth and at each corner and plan irregularity.
- B. Separate slabs on grade from vertical surfaces with joint filler. Extend joint filler from bottom of slab to within 1/4 inch of finished slab surface.
- C. Construct slab on grade and shored elevated floor slabs with overall specified FF30/FL20 and with minimum FF15/FL10 for individual floor sections in accordance with ACI 302.1. Determination of FF/FL numbers will be in accordance with ASTM E 1155. The contractor will take remedial measures when floor slabs do not meet specified requirements.

### 3.6 FINISHING FORMED SURFACES

- A. Repairs: Repair surface defects, including tie holes, immediately after removing formwork.
  1. Remove honeycombed areas and other defective concrete down to sound concrete, cutting perpendicular to surface or slightly undercutting. Dampen patch location and area immediately surrounding it prior to applying bonding compound or patching mortar.
  2. Before bonding compound has dried, apply patching mixture matching original concrete in materials and mix except for omission of coarse aggregate, and using a blend of white and normal Portland cement as necessary to achieve color match. Consolidate thoroughly and strike off slightly higher than surrounding surface.
- B. Unexposed Form Finish: Repair tie holes and patch defective areas. Rub down or chip off fins or other raised areas exceeding 1/4 inch height.
- C. Exposed Form Finish: Repair and patch defective areas, with fins or other projections completely removed and smoothed.
  1. Smooth rubbed finish: Apply to surfaces indicated no later than 24 hours after form removal.

2. Wet concrete surfaces to be finished and rub with abrasive until uniform color and texture are achieved.
  3. Do not apply separate grout mixture.
- D. Contiguous unformed surfaces: Strike smooth and float to a similar texture tops of walls, horizontal offsets, and other unformed surfaced adjacent to or contiguous with formed surfaces. Continue final finish of formed surfaces across unformed surfaces, unless otherwise specifically indicated.

### 3.7 CURING AND PROTECTION

- A. Working and walking on concrete shall be avoided for at least 24 hours after casting. Protect concrete from sun and rain. Do not permit concrete to become dry during curing period. Concrete shall not be subjected to any loads until concrete is completely cured, and until concrete has attained its 28 day strength and 14 days minimum.
- B. Protect concrete during and after curing from damage during subsequent building construction operations.
- C. Cover traffic areas with plywood or other suitable means for as long as necessary to protect concrete from damage.
- D. Immediately upon completion of finishing operation, the surface of slabs shall be sealed against moisture loss by the application of one of the following methods for 7 days:
1. Apply a curing blanket made of polyethylene bonded to burlap in accordance with the manufacturer's instructions.
  2. Apply waterproof curing paper with edges lapped and sealed with tape. The curing membrane shall be weighted down. Tears and rips in curing membrane shall be repaired immediately during curing period.
- E. Specific curing requirements for walls, beams and columns shall include the following:
1. Concrete in forms shall be kept moist until removal.
  2. Immediately upon removal of forms, an approved sprayed-on curing compound shall be applied to the concrete surfaces in strict compliance with the manufacturer's recommendations.
  3. Curing shall be maintained for 7 days.

### 3.8 MISCELLANEOUS CONCRETE ITEMS

- A. Fill-in: Fill in holes and openings left in concrete structures for passage of work by other trades after such work is in place. Place such fill-in concrete to blend with existing construction, using same mix and curing methods.
- B. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Screed, tamp, and finish concrete surfaces as scheduled.
- C. Reinforced Masonry: Provide concrete grout for reinforced masonry where indicated on drawings and as scheduled.

### 3.9 FIELD QUALITY CONTROL

- A. Composite Sampling and Making and Curing of Specimens: ASTM C172 and ASTM C31.
  - 1. Take samples at point of discharge.
  - 2. For pumped concrete, perform sampling and testing at the frequencies specified herein at point of delivery to pump, and perform additional sampling and testing at the same frequency at discharge from line. Results obtained at point of delivery shall be used for acceptance of concrete.
  - 3. Take samples and perform tests for concrete before and after field addition of admixtures. Report results of all tests.
- B. Slump: ASTM C143. Test first 2 loads delivered for each pour and 1 test per strength test and additional tests if concrete consistency changes.
  - 1. Modify sampling to comply with ASTM C94.
  - 2. For concrete containing superplasticizer added at the job site, perform slump test prior to addition of admixture and after mixing. Report both test results.
  - 3. Visual estimate of slump may be accepted once uniform results are achieved over a minimum of 4 samples. Report all estimated results as such.
- C. Air Content of concrete: ASTM C173 or ASTM C231. Test first 2 loads delivered for each pour and one test per strength test performed on air-entrained concrete.
- D. Concrete Temperature:
  - 1. Test hourly when air temperature is 40 degrees F or below.
  - 2. Test hourly when air temperature is 90 degrees F or above.
  - 3. Test each time a set of strength test specimens is made.
- E. Compressive Strength Tests: ASTM C39.
  - 1. Compression test specimens: Mold and cure one set of 4 standard cylinders for each compressive strength test required.
  - 2. Testing for acceptance of potential strength of as-delivered concrete:
    - a. Obtain samples on a statistically sound, random basis.
    - b. Provide one test per 50 cubic yards or fraction thereof for each day's pour of each concrete class.
    - c. Provide one test per 2500 square feet of slab or wall area or fraction thereof for each day's pour of each concrete class.
    - d. When the above testing frequency would provide fewer than 5 strength tests for a given class of concrete during the project, conduct testing from not less than 5 randomly selected batches or from each batch if fewer than 5.
    - e. Test one specimen per set at 7 days for information unless an earlier age is required.
    - f. Test 2 specimens per set for acceptance of strength potential; test at 28 days unless other age is specified. The test result shall be the average of the two specimens. If one specimen shows evidence of improper sampling, molding,

- or testing, the test result shall be the result of the remaining specimen; if both show such evidence, discard the test result and inform the engineer.
- g. Retain one specimen from each set for later testing, if required.
  - h. Strength potential of as-delivered concrete will be considered acceptable if all of the following criteria are met:
    - i. No individual test result falls below specified compressive strength by more than 500 psi.
    - ii. Not more than 10 percent of individual test results fall below specified compressive strength.
    - iii. Average of any 3 consecutive strength test results equals or exceeds specified compressive strength.
  - i. Evaluate construction and curing procedures and implement corrective action when strength results for field-cured specimens are less than 85 percent of test values for companion laboratory-cured specimens.
- F. Test Results: Testing agency shall report field and laboratory test results in writing to engineer and contractor within 24 hours of test.
- 1. Field test results which do not comply with the project specifications shall be immediately reported to project superintendent. Field reports shall include documentation of all such reports and the name of the person results were reported to.
  - 2. Test reports shall contain the following data:
    - a. Project name, number, and other identification.
    - b. Name of concrete testing agency.
    - c. Date and time of sampling.
    - d. Concrete type and class.
    - e. Location of concrete batch in the completed work.
    - f. All information required by respective ASTM Test methods.
    - g. Concrete mix parameters and tolerances.
  - 3. Nondestructive testing may be used at engineer's option for assistance in determining probable concrete strength at various locations or for selecting areas to be cored, but such tests shall not be the sole basis for acceptance or rejection.
  - 4. The testing agency shall make additional tests of in-place concrete as directed by the engineer when test results indicate that specified strength and other concrete characteristics have not been attained.
    - a. Testing agency may conduct tests of cored cylinders complying with ASTM C42, or tests as directed.
    - b. Cost of additional testing shall be borne by the contractor when unacceptable concrete has been verified.

END OF SECTION 033000



## SECTION 035400 – CONCRETE UNDERLAYMENT PATCH

### PART I – GENERAL

#### 1.01 SUMMARY

- A. This is the recommended specification for ARDEX SD-P InstantPatch, Self-Drying, Fast-Setting, Concrete Underlayment Trowelable Patch for smoothing and repairing concrete floors, ramps, stairways, as well as non-porous substrates such as terrazzo, ceramic and quarry tile prior to the installation of floor covering.

#### 1.02 SECTION INCLUDES

- A. ARDEX SD-P InstantPatch Self-Drying, Fast-Setting Concrete Underlayment Patch.
- B. ARDEX LU-100 Self-Leveling Floor Underlayment
- C. ARDEX P-51 Primer
- D. ARDEX P-82 Ultra Prime.
- E. Architect/Engineer Approved Equal.

#### 1.03 QUALITY ASSURANCE

- A. Installation of the cement-based, self-drying, fast-setting trowelable underlayment patch must be made by the applicator using mixing equipment and tools approved by the manufacturer.
- B. Installation of the hydraulic cement-based, self-leveling underlayment must be by an applicator using mixing equipment and tools approved by the manufacturer.
- C. Provide ARDEX SD-P InstantPatch Self-Drying, Fast-Setting Concrete Underlayment Patch as manufactured by ARDEX INC., 400 Ardex Park Drive, Aliquippa, PA 15001.
- D. Underlayment shall be installed from a featheredge to ¼" over any size area, up to ½" in areas of 20 sq. ft. or less and up to 1" deep in areas up to 4 sq. ft.
- E. Underlayment shall be able to be installed from a featheredge to 2" in one pour and up to 5" thick in small areas.
- F. Underlayment shall develop a minimum compressive strength of 4200 psi after 28 days per ASTM C109/mod (air cure only).
- G. No primer is required for underlayment when used over standard absorbent concrete.
- H. Underlayment shall be able to be covered by most flooring materials as soon as the surface is sufficiently hardened (usually within an hour). Parquet, athletic flooring and flooring requiring special adhesives shall be installed in 16 hours.
- I. Underlayment shall be walkable after 3 hours at 70°F and be able to be covered by finish flooring material in 2-3 days, depending upon thickness of installation.

#### 1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in their unopened packages and protect from extreme temperatures and moisture. Protect liquids from freezing.

#### 1.05 SITE CONDITIONS

- A. ARDEX SD-P is a cementitious material. Observe the basic rules of concrete work. Do not install below 50°F surface temperature. Install quickly if floor is warm and follow hot weather precautions available from the ARDEX Technical Service Department. Never mix with cement or additives other than ARDEX-approved products.
- B. ARDEX LU-100 contains blended hydraulic cements and powdered polymers. Do not install in applications on or below grade unless the concrete substrate has already been treated with ARDEX MC™ MOISTURE CONTROL SYSTEM or approved equal. Do not install below 50°F surface temperature. Install quickly if floor is warm and follow hot weather precautions available from the Ardex Technical Service Department. Never mix with cement or additives.

### PART 2 – PRODUCTS

#### 2.01 MATERIALS

- A. The Portland cement-based, self-drying, fast-setting, trowelable underlayment patch shall be ARDEX SD-P InstantPatch Self-Drying, Fast-Setting Concrete Underlayment Patch.
- B. No primer required over standard absorbent concrete.
- C. Primer for non-porous, and highly smooth substrates, shall be ARDEX P-82 Ultra Prime.
- D. Water shall be clean, potable, and sufficiently cool (not warmer than 70°F).
- E. The hydraulic cement-based self-leveling underlayment shall be ARDEX LU-100 SELF-LEVELING FLOORING UNDERLAYMENT.
- F. Primer for standard absorbent concrete subfloors, well bonded patching compounds, and other porous surfaces shall be ARDEX P 51 PRIMER diluted 1:1 with water.
- G. Primer for well-bonded, non-water soluble adhesive residues shall be ARDEX P 51 PRIMER undiluted or ARDEX P 82 ULTRA PRIME.
- H. Primer for all other non-porous surfaces to include terrazzo, burnished or sealed concrete, ceramic and quarry tile, acrylic curing compounds, and epoxy coatings shall be ARDEX P 82 ULTRA PRIME.
- I. Water shall be clean, potable, and sufficiently cool (not warmer than 70°F)
- J. Repair of small gouges, indentations and holes, as well as skim coating large areas, can be done using ARDEX FEATHER FINISH® SELF-DRYING, CEMENT-BASED FINISHING UNDERLAYMENT.

## 2.02 MIX DESIGNS

- A. Mixing Ratios: Standard mixing ratio: Mix 1 bag of ARDEX SD-P (40 lbs.) with 4 quarts of water. Product can be mixed in a clean 5-gallon pail using ARDEX T-2 Mixing Paddle and a ½" heavy-duty drill (min. 650 rpm). Mix thoroughly for approximately 2-3 minutes to obtain a lump-free mixture. Follow written instructions per ARDEX SD-P bag label.
- B. Underlayment shall be installed using a wood or magnesium float. When underlayment begins to harden, finish with a steel trowel.
- C. Underlayment can receive floor covering as soon as the surface becomes sufficiently hard (about 1 hour). Parquet, athletic flooring and flooring requiring special adhesives can be installed in 16 hours.
- D. Mixing Ratio: ARDEX LU-100 is mixed in 2-bag batches at one time. Mix each bag of ARDEX LU-100 (50 lb.) with 4 quarts of water. Product shall be mixed in an ARDEX T-10 Mixing Drum using an ARDEX T-4 Mixing Paddle and a ½" heavy-duty drill (min. 650rpm). Mix thoroughly for approx. 2-3 minutes to obtain a lump-free mixture. Follow written instructions per the ARDEX LU-100 bag label.
- E. For pump installations, ARDEX LU-100 shall be mixed using the ARDEX Levelcraft Automatic Mixing Pump. Start the pump at 130 gallons of water per hour, then adjust to the minimum water reading which still allows self-leveling properties. DO NOT OVERWATER! Check the consistency of the product on the floor to ensure a uniform distribution of the sand aggregate at both the top surface and bottom of the pour. If settling is occurring, reduce the water amount and recheck. Conditions during the installation, such as variations in water, powder, substrate, and ambient temperature, require that the water setting be monitored and adjusted carefully to avoid overwatering.

## PART 3 – EXECUTION

### 3.01 PREPARATION

- A. All surfaces must be sound, solid, cleaned, and where required, properly primed.
- B. All concrete subfloors must be of adequate strength, clean, and free of oil, grease, dirt, curing compounds, and any substance, which might act as a bondbreaker. Mechanically clean, if necessary, using shot blasting or other. Acid etching and the use of sweeping compounds and solvents are not acceptable.
- C. All non-porous substrates such as ceramic tile, terrazzo, etc., must be well bonded, clean and free of wax, dressings and sealers. If necessary, have the surface professionally cleaned.
- D. All cracks in the subfloor shall be repaired to minimize telegraphing through the underlayment.
- E. Substrates shall be tested and corrected for moisture and for any other condition, which could affect the performance of the underlayment and the finish floor covering, before installing the patch.
- F. All concrete subfloors and concrete floors with existing patching must be solid, sound, solid, thoroughly cleaned, and properly primed.

1. All concrete subfloors must be of adequate strength, clean, and free of all oil, grease, dirt, curing compounds and any substance, which might act as a bondbreaker. Mechanically clean, if necessary, using shot blasting or other. Acid etching and the use of sweeping compounds and solvents are not acceptable.
2. All cracks in the subfloor shall be repaired to minimize telegraphing into the underlayment.
3. Subfloors shall be inspected and corrected for moisture or any other conditions which could affect the performance of the underlayment or finished floor covering.

G. Priming

1. No primer required for porous concrete floors.
2. Primer for non-porous substrates.
3. Prime with ARDEX P-82 Ultra Prime. Mix Part A (red) and Part B (white) and apply evenly with a short-nap or foam paint roller, leaving a thin coat of primer no heavier than a thin coat of paint. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, slightly tacky film (min. 3 hours, max. 24 hours). Underlayment shall not be applied until primer is dry.
4. Primer coverage approximately 200 to 400 square feet per gallon.

H. Priming ARDEX LU-100 Priming

1. Extremely absorbent substrates
  - i. Mix ARDEX P-51 3:1 with water and apply evenly with a soft pushbroom. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, thin film (One to three hours). Second coat of Primer shall not be applied until initial primer application is completely dry.
  - ii. Mix ARDEX P-51 1:1 with water and apply evenly with a soft pushbroom. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, thin film (minimum 3 hours, maximum 24 hours). ARDEX LU-100 Underlayment shall not be installed until second primer application is completely dry.
2. Non-water soluble adhesive residues – Use ARDEX P 51 PRIMER at full strength and install as above.
3. Non-porous substrates: Prime with ARDEX P 82 ULTRA PRIME. Mix Part A (red) with Part B (white) and apply with a short-nap or sponge paint roller, leaving a thin coat of primer no heavier than a thin coat of paint. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, slightly tack film (minimum 3 hours, maximum 24 hours). Underlayment shall not be installed until primer is dry. Primer coverage is approximately 200 to 400 square feet per gallon.

### 3.02 APPLICATION OF UNDERLAYMENT

- A. Pour or pump the ARDEX LU-100 and spread with the ARDEX T-4 Spreader. Use the ARDEX T-5 Smoother for featheredge and touch-up. Wear baseball shoes with

nonmetallic cleats to avoid leaving marks in the ARDEX LU-100. Underlayment can be carefully walked on in 3 hours at 70°F.

### 3.03 PREPARATION FOR FLOORING INSTALLATION

- A. Underlayment can accept finish floor covering materials after 2-3 days at 70°F/50% R.H. depending upon thickness. Perform a moisture test in accordance with ASTM D4263 before installing the finish flooring.

### 3.04 FIELD QUALITY CONTROL

- A. Where specified, field sampling of the Ardex topping is to be done by taking an entire unopened bag of the product being installed to an independent testing facility to perform compressive strength testing in accordance with ASTM C 109/modified: air-cure only. There are no in situ test procedures for the evaluation of compressive strength.

### 3.05 PROTECTION

- A. Prior to the installation of the finish topping, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, Masonite or other suitable protection course.

END OF SECTION 035400



## SECTION 035416 – CEMENT-BASED, INTERIOR, SELF LEVELING UNDERLAYMENT

### 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.
- B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

#### 1.02 SUMMARY

- A. Cement-based, interior, self-leveling underlayment.

#### 1.03 SECTION INCLUDES

- A. Cement-based, interior, self-leveling underlayment used to create a smooth, flat or level surface prior to the installation of floor coverings.
  - 1. Cement-based, interior, self-leveling underlayment
  - 2. Primer
  - 3. Vapor mitigation product
  - 4. Fiber reinforcement material
  - 5. Finishing underlayment compound
- B. Related Sections include the following:
  - 1. Section 033000 - Cast-In-Place Concrete
  - 2. Division 09 Flooring Sections

#### 1.04 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with all applicable requirements and standards.
- D. ASTM C109M, Compressive Strength Air-Cure Only
- E. ASTM C348, Flexural Strength of Hydraulic Cement Mortars
- F. ASTM C190, Method of Test for Tensile Strength of Hydraulic Cement Mortars

- G. ASTM C1583, Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension
- H. ASTM C4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
- I. ASTM F2170, Relative Humidity in Concrete Floor Slabs Using in situ Probes
- J. ASTM F1869, Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
- K. ASTM 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
- L. Resilient Floor Covering Institute booklet "Recommended Work Practices for the Removal of Resilient Floor Coverings"

#### 1.05 QUALITY ASSURANCE

- A. Installation of CMP SPECIALTY PRODUCTS LEVEL-1 must be by a trained applicator regularly engaged and properly equipped for application of concrete floor underlayment. Please contact your local CMP SPECIALTY PRODUCTS distributor for a list of Installers.
- B. Product shall be able to be installed from 1/4 inch to 3 inches thickness neat and up to 5-inches properly extended with aggregate over well-defined areas.
- C. Product shall be formulated to develop a compressive strength of 5000 psi when tested in accordance with ASTM C109/modified for air-cured conditions.
- D. Product shall be able to be covered by thinset ceramic tile in 24 hours, water-based sealers and adhesives for standard coverings in 48 hours, epoxy or urethane adhesives and moisture sensitive coverings in 3 to 5 days. For application of epoxy coatings < 20 mils: 24 hours and high build epoxy coatings > 20 mils: 5 to 7 Days. Always ensure underlayment is totally dry especially when using moisture sensitive adhesive and floor coverings.
- E. Product produces a hard-durable surface that can be left open to normal construction traffic for up to one year before the installation of finished flooring. CMP SPECIALTY PRODUCTS LEVEL-1 can be feather edged to meet existing transitions.

#### 1.06 SUBMITTALS

- A. Product Data: Product data in the form of technical data, specifications, and installation instructions.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original undamaged packages or acceptable bulk containers.
- B. Store packaged materials to protect them from elements or physical damage.
- C. Do not use which shows indications of moisture damage, caking, or other signs of deterioration.

1.08 PROJECT CONDITIONS

- A. Do not place the product when ambient temperature is below 50 degrees F (10 degrees C) or above 95 degrees F (35 degrees C).

PART 2 – PRODUCTS

2.01 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 MATERIALS

- A. Self-Leveling Underlayment: Free-flowing, self-leveling, pumpable, cement-based compound for applications from 1/4 inch to 3 inches. Applications up to 5 inches in thickness properly extended with aggregate.

BASIS OF DESIGN

- 1. CMP SPECIALTY PRODUCTS “LEVEL-1”
  - a. Flow Working Time: 25 minutes
  - b. Final Set: Approximately 90 minutes, ASTM C191
  - c. Compressive Strength:
    - i. 1500 psi at 1 day, ASTM C109M
    - ii. 3000 psi at 7 days, ASTM C109M
    - iii. 5000 psi at 28 days, ASTM C109M
  - d. Flexural Strength: 1000 psi at 28 days, ASTM 348
  - e. Tensile Strength: 520 psi at 28 days, ASTM C190
  - f. VOC: 0g/L, calculated SCAQMD 1168
- 2. Architect Approved Equal
- B. Underlayment Primer: Premium primer designed for use with CMP’s line of underlayments and toppings.
  - 1. CMP SPECIALTY PRODUCTS “AS-100”
  - 2. CMP SPECIALTY PRODUCTS “LOCKDOWN” with sand broadcast. Note: CMP SPECIALTY PRODUCTS LOCK DOWN with sand broadcast is required for applications subject to dynamic rolling loads and when CMP SPECIALTY PRODUCTS LEVEL-1 is used as a prefill for CMP SPECIALTY PRODUCTS DIAMOND CAP installations.
- C. Vapor Mitigation and Remediation Product: 100% solids, two-component, resin based, membrane forming, moisture mitigation system.

1. CMP SPECIALTY PRODUCTS "LOCKDOWN"
- D. Redispersible Fiber Mat: Fiber reinforcement mat for use with wood, unstable and distressed subfloors.
  1. CMP SPECIALTY PRODUCTS "MEDIMAT"
- E. Finishing Underlayment Compound: Trowelable, cement-based smoothing compound for applications from feather edge to ½ inch thick.
  1. CMP SPECIALTY PRODUCTS "PREPSTAR"
- F. Polished, Self Leveling Topping: Calcium Aluminate/Portland cement based self-leveling topping for applications from 1/4 inch to 2 inches thickness and suitable to receive a mechanical concrete polish process.
  1. CMP SPECIALTY PRODUCTS DIAMOND CAP
- G. Self Leveling Topping: Premium free-flowing, self-leveling, pumpable, calcium aluminate/Portland cement-based compound for applications from 1/8 inch to 1/2 inch thickness.
  1. CMP SPECIALTY PRODUCTS LIQUICEM
- H. Aggregate: For extension on CMP SPECIALTY PRODUCTS LEVEL-1 in 3 inch to 5 inch thick applications.

## 2.03 MIXING EQUIPMENT

- A. Provide suitable batch type mechanical mixer for mixing topping material at the Project Site. Equip batch mixer with a suitable charging hopper, water storage tank, and a water-measuring device. Use only mixers which are capable of mixing aggregates, cement, and water into a uniform mix within specified time, and of discharging mix without segregation.
- B. Provide suitable mixing-pump such as m-tec, Duo 2000 which includes dual mixing action and wet material probe for consistent mix water monitoring.
- C. Provide a suitable barrel, to mix 2-bag batches of product. Provide a suitable dispensing container for measuring a maximum 5.5 quarts of clean cold water for each bag of product. Provide a heavy duty 1/2" drill (min. 850 rpm) with product mixing wand to mix product to a lump free consistency without entraining excess air.

## PART 3 - EXECUTION

### 3.01 PREPARATION (BASIS OF DESIGN PRODUCT)

- A. Concrete subfloors: Prepare substrate in accordance with CMP SPECIALTY PRODUCTS' instructions.
  1. Refer to ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring before proceeding.

2. Concrete subfloors must be sound, clean and free of all dirt, oil, grease, laitance, curing compounds and any substance that may act as a bond breaker. If necessary, mechanically clean and remove contaminants by chipping, shot-blasting, grinding or scarifying. Removal with solvents, strippers and acid etching are not acceptable.
  3. All cracks in the subfloor must be repaired or treated to minimize crack telegraphing through the underlayment/topping. Moving cracks, working cracks, expansion joints and isolation joints must be honored through the applied CMP SPECIALTY PRODUCTS LEVEL-1.
  4. Substrates shall be inspected and tested for moisture in accordance with ASTM F1869 and/or ASTM 2170. Substrates must be corrected for moisture or any other conditions that could affect the underlayment/topping performance or finished floor covering. Utilize CMP SPECIALTY PRODUCTS LOCKDOWN topical moisture vapor mitigation system where moisture and vapor emissions exceed the floor covering manufacturer's required limits.
- B. Wooden subfloors: Requires the use of CMP SPECIALTY PRODUCTS MEDIMAT™ redispersible fiber reinforcement mat.
1. Must be a minimum of ¾ inch, untreated, APA Rated, Type-1, exterior grade plywood, OSB or equal. The subfloor must be free of deflection (L/360 maximum) considering both live and dead loads. Subfloor must be clean, sound and free of all foreign matter that will inhibit bond.
  2. Prepare by sanding down to bare wood. Secure loose boards with deck screws and fill open seams with CMP SPECIALTY PRODUCTS PREPSTAR. Replace any weak or water damaged wood.
  3. Use an approved anti-fracture membrane over CMP SPECIALTY PRODUCTS LEVEL-1 in areas where Ceramic Tile or Stone are being installed.
- C. Non-Porous floors: Epoxy, Terrazzo, and ceramic and quarry tile must be abraded to a dull finish. Vacuum or wet vacuum the surface to remove dust and laitance.
- D. Adhesive residue: Thin, translucent adhesive residue must be non-water soluble, free of tack and well bonded to the substrate. The adhesive Cutback must be prepared using the wet scrape method as outlined in the Resilient Floor Covering Institute booklet "Recommended Work Practices for the Removal of Resilient Floor Coverings". Remove all patching materials below the adhesive and avoid applications where heat or excessive moisture will soften or degrade the adhesive. If unsure about the suitability, deflection or if heavy loads are expected, use the VERY DISTRESSED SUBFLOORS Application Method below.
- E. Very distressed subfloors: Requires the use of CMP SPECIALTY PRODUCTS MEDIMAT™ redispersible fiber reinforcement mat for use with wood, unstable and distressed subfloors.
1. ALL substrates must be clean, dry, between 50° and 95°F (10° and 30°C) and free of oil, loose (floorcovering, patching compounds or surface material). Remaining materials must be unaffected by the moisture incurred from the placement of self-leveling. Never use Acid or Mastic Removers on any surface to which a CMP product will be applied.

- F. Gypsum substrates: Requires the use of CMP SPECIALTY PRODUCTS MEDIMAT™ redispersible fiber reinforcement mat.
  - 1. Remove all loose debris from subfloor. Sweep and vacuum the substrate.
- G. Metal substrates: Substrate must be prepared by abrasive cleaning to a White metal finish, structurally sound and free of deflection (L/360 maximum). Remove all residue using a dry cleaning method or wipe down with Xylene.

### 3.02 INSTALLATION (BASIS OF DESIGN PRODUCT)

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with CMP SPECIALTY PRODUCTS published recommendations.
- C. Concrete subfloors: Apply one coat of CMP SPECIALTY PRODUCTS AS-100 diluted 50/50 (1 part water: 1 part CMP SPECIALTY PRODUCTS AS-100) using a split tip broom. Pour out and work into surface leaving no puddles or bare spots. Apply CMP SPECIALTY PRODUCTS LEVEL-1 once CMP SPECIALTY PRODUCTS AS-100 is dry (Minimum 1 hour) and up to 24 hours. If primer has dried longer than 24 hours, a second coat of CMP SPECIALTY PRODUCTS AS-100 may be required.
- D. Wooden subfloors: Requires the use of CMP SPECIALTY PRODUCTS MEDIMAT™ redispersible fiber reinforcement mat.
  - 1. Apply one thin coat of CMP SPECIALTY PRODUCTS AS-100 (Undiluted) using a 3/8 inch nap roller. Apply CMP SPECIALTY PRODUCTS LEVEL-1 once CMP SPECIALTY PRODUCTS AS-100 is dry (Minimum 2 hours) and up to 24 hours. If CMP SPECIALTY PRODUCTS AS-100 has dried longer than 24 hours, a second coat of CMP SPECIALTY PRODUCTS AS-100 may be required.
  - 2. Roll out CMP SPECIALTY PRODUCTS MEDIMAT over the properly prepared and primed surface. Overlap all seams a minimum of 1 inch and cut to fit using scissors. A single layer of CMP SPECIALTY PRODUCTS MEDIMAT can be used to reinforce CMP SPECIALTY PRODUCTS LEVEL-1 applications up to 1 inch thick. Place an additional layer of mat for thicknesses up to 2". Mat installation does not need to be "Wrinkle Free" as the product breaks down into individual fibers after the CMP SPECIALTY PRODUCTS LEVEL-1 is placed.
  - 3. Place a minimum of ½ inch of CMP SPECIALTY PRODUCTS LEVEL-1 over CMP SPECIALTY PRODUCTS MEDIMAT.
  - 4. Once the mat is covered, gauge rake. Working the underlayment in a crosshatch pattern with a CMP SPECIALTY PRODUCTS Porcupine or Agitating Roller may be required to properly disperse the fiber; fibers should be visible in the CMP SPECIALTY PRODUCTS LEVEL-1. Pouring or pumping the self-leveling back into already placed material will help in dispersing the fibers.
  - 5. Finish with a CMP SPECIALTY PRODUCTS smoother.

6. Depending on the sensitivity of finished covering, sanding or skim coating using CMP SPECIALTY PRODUCTS PREPSTAR trowelable underlayment or capping with CMP SPECIALTY PRODUCTS LEVEL-1 or CMP SPECIALTY PRODUCTS LIQUICEM may be required to suppress any residual fiber texture remaining in the CMP SPECIALTY PRODUCTS LEVEL-1.
- E. Non-Porous floors: Apply one thin coat of CMP SPECIALTY PRODUCTS AS-100 (Undiluted) using a ¼ inch nap roller. Apply CMP SPECIALTY PRODUCTS LEVEL-1 once CMP SPECIALTY PRODUCTS AS-100 is dry (Minimum 1 hour) and up to 24 hours. If CMP SPECIALTY PRODUCTS AS-100 has dried longer than 24 hours, a second coat of CMP SPECIALTY PRODUCTS AS-100 may be required.
  - F. Adhesive residue: Apply one thin coat of CMP SPECIALTY PRODUCTS AS-100 (Undiluted) using a 3/8 inch nap roller. Apply CMP SPECIALTY PRODUCTS LEVEL-1 once CMP SPECIALTY PRODUCTS AS-100 is dry (Minimum 2 hours) and up to 24 hours. If CMP SPECIALTY PRODUCTS AS-100 has dried longer than 24 hours, a second coat of CMP SPECIALTY PRODUCTS AS-100 may be required.
  - G. Very distressed subfloors: Requires the use of CMP SPECIALTY PRODUCTS MEDIMAT™ redispersible fiber reinforcement mat.
    1. Apply one thin coat of CMP SPECIALTY PRODUCTS AS-100 (Undiluted) using a 3/8 inch nap roller. Apply CMP SPECIALTY PRODUCTS LEVEL-1 once CMP SPECIALTY PRODUCTS AS-100 is dry (Minimum 2 hours) and up to 24 hours. If CMP SPECIALTY PRODUCTS AS-100 has dried longer than 24 hours, a second coat of CMP SPECIALTY PRODUCTS AS-100 may be required.
    2. Roll out CMP SPECIALTY PRODUCTS MEDIMAT™ over the properly prepared and primed surface. Overlap all seams a minimum of 1 inch and cut to fit using scissors. A single layer of CMP SPECIALTY PRODUCTS MEDIMAT™ can be used to reinforce CMP SPECIALTY PRODUCTS LEVEL-1 applications up to 1 inch thick. Place an additional layer of mat for thicknesses up to 2 inches. Mat installation does not need to be “Wrinkle Free” as the product breaks down into individual fibers after the CMP SPECIALTY PRODUCTS LEVEL-1 is placed.
    3. Place a minimum of ½ inch of CMP SPECIALTY PRODUCTS LEVEL-1 over CMP SPECIALTY PRODUCTS MEDIMAT.
    4. Once the mat is covered, gauge rake. Working the underlayment in a crosshatch pattern with a CMP SPECIALTY PRODUCTS Porcupine or Agitating Roller may be required to properly disperse the fiber; fibers should be visible in the CMP SPECIALTY PRODUCTS LEVEL-1. Pouring or pumping the self-leveling back into already placed material will help in dispersing the fibers.
    5. Finish with a CMP SPECIALTY PRODUCTS smoother.
    6. Depending on the sensitivity of finished covering, sanding or skim coating using CMP SPECIALTY PRODUCTS PREPSTAR trowelable underlayment or capping with CMP SPECIALTY PRODUCTS LEVEL-1 or CMP SPECIALTY PRODUCTS LIQUICEM may be required to suppress any residual fiber texture remaining in the CMP SPECIALTY PRODUCTS LEVEL-1.
  - H. Gypsum substrates: Requires the use of CMP SPECIALTY PRODUCTS MEDIMAT redispersible fiber reinforcement mat.

1. The first primer coat should be diluted and applied at 1 part CMP SPECIALTY PRODUCTS AS-100: 3 parts water using a split tip Broom. Pour out and work into surface leaving no puddles or bare spots.
2. After initial coat is dry (Minimum 1 hour) apply the second coat of CMP SPECIALTY PRODUCTS AS-100 diluted 50/50 (1 part water: 1 part CMP SPECIALTY PRODUCTS AS-100) using a split tip broom. Pour out and work into surface leaving no puddles or bare spots.
3. Install CMP SPECIALTY PRODUCTS MEDIMAT™ as per TDS once CMP SPECIALTY PRODUCTS AS-100 is completely dry (Minimum 2 hours) and up to 24 hours. If Primer has dried longer than 24 hours, an additional coat of CMP SPECIALTY PRODUCTS AS-100 may be required.
4. Roll out CMP SPECIALTY PRODUCTS MEDIMAT™ over the properly prepared and primed surface. Overlap all seams a minimum of 1 inch and cut to fit using scissors. A single layer of CMP SPECIALTY PRODUCTS MEDIMAT™ can be used to reinforce CMP SPECIALTY PRODUCTS LEVEL-1 applications up to 1 inch thick. Place an additional layer of mat for thicknesses up to 2 inches. Mat installation does not need to be “Wrinkle Free” as the product breaks down into individual fibers after the CMP SPECIALTY PRODUCTS LEVEL-1 is placed.
5. Place a minimum of ½ inch of CMP SPECIALTY PRODUCTS LEVEL-1 over CMP SPECIALTY PRODUCTS MEDIMAT.
6. Once the mat is covered, gauge rake. Working the underlayment in a crosshatch pattern with a CMP SPECIALTY PRODUCTS Porcupine or Agitating Roller may be required to properly disperse the fiber; fibers should be visible in the CMP SPECIALTY PRODUCTS LEVEL-1. Pouring or pumping the self-leveling back into already placed material will help in dispersing the fibers.
7. Finish with a CMP SPECIALTY PRODUCTS smoother.
8. Depending on the sensitivity of finished covering, sanding or skim coating using CMP SPECIALTY PRODUCTS PREPSTAR trowelable underlayment or capping with CMP SPECIALTY PRODUCTS LEVEL-1 or CMP SPECIALTY PRODUCTS LIQUICEM may be required to suppress any residual fiber texture remaining in the CMP SPECIALTY PRODUCTS LEVEL-1.

### 3.03 MIXING (BASIS OF DESIGN PRODUCT)

- A. Use CMP SPECIALTY PRODUCTS mixing drum, to mix 2-bag batches of CMP SPECIALTY PRODUCTS LEVEL-1. Add a maximum 5.5 quarts of clean cold water for each bag of CMP SPECIALTY PRODUCTS LEVEL-1 to the mixing drum or barrel. Then, add bags of CMP SPECIALTY PRODUCTS LEVEL-1 while mixing at full speed with a CMP SPECIALTY PRODUCTS mixing wand attached to a heavy duty ½ inch drill (min. 850 rpm). Mix for 2 minutes or until lump free. Add no additional water and keep the mixing wand immersed in the material to avoid entraining excess air.
- B. Aggregate mix: For installation areas over 2 inches (5 cm) in thickness, up to 1 part by volume of well graded, washed pea gravel must be added. Aggregates should be hard, high density and non-absorbent. Before attempting to use any aggregate, conduct testing to determine suitability. All aggregate should be clean and dry. Do not use sand or exceed 1 part aggregate by volume. Combine aggregate once material is lump free and

mix until aggregate is completely coated. Aggregate addition will diminish workability and may make it necessary to install a finish layer. Allow the first installation to dry 12 to 16 hours before topping.

- C. For pump installations, please contact CMP SPECIALTY PRODUCTS for instructions, recommended pumping procedures and approved equipment.

#### 3.04 PLACING (BASIS OF DESIGN PRODUCT)

- A. Place underlayment in accordance with CMP SPECIALTY PRODUCTS' instructions, using equipment and procedures to facilitate continuous placement, avoid segregation of mix and prevent excessive air content. Pour or pump, gauge rake with a CMP SPECIALTY PRODUCTS gauge rake and smooth with a CMP SPECIALTY PRODUCTS smoother in a continuous operation until an entire panel or section of floor area are completed. Do not work mix except for raking or smoothing.

#### 3.05 CURING AND PROTECTION (BASIS OF DESIGN PRODUCT)

- A. Cure and protect CMP SPECIALTY PRODUCTS LEVEL-1 underlayment/topping applications and finishes as specified CMP SPECIALTY PRODUCTS. CMP SPECIALTY PRODUCTS LEVEL-1 is self-curing. Do not use cure & seals or any other curing methods.
- B. During application and for the first 24 hours, prevent excessive air movement but maintain adequate ventilation and protect material from direct sunlight to prevent uneven curing patterns, false set and cracking.

#### 3.06 PERFORMANCES (BASIS OF DESIGN PRODUCT)

- A. Failure of CMP SPECIALTY PRODUCTS LEVEL-1 to bond to substrate, or disintegration or other failure of topping to perform as a floor underlayment or topping compound will be considered failure of materials and/or workmanship. Repair or replace CMP SPECIALTY PRODUCTS LEVEL-1 in areas of such failures, as directed by CMP SPECIALTY PRODUCTS.

END OF SECTION 035416



## SECTION 040121 - UNIT MASONRY REPLACEMENT

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes maintenance of unit masonry consisting of brick clay masonry restoration and cleaning as follows:
  - 1. Mortar Analysis
  - 2. Repairing & replacing unit masonry
  - 3. Repointing joints.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.
- B. Samples for Initial Selection for the following:
  - 1. Sealant Materials: See Division 07 Section "Joint Sealants."
  - 2. Include similar Samples of accessories involving color selection
- C. Samples for Verification: For the following:
  - 1. Each type of masonry unit to be used for replacing existing units (if the existing units cannot be salvaged and reused). Include sets of Samples as necessary to show the full range of shape, color, and texture to be expected.
    - a. For each brick type, provide straps or panels containing at least four bricks. Include multiple straps for brick with a wide range.
  - 2. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.
    - a. Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.
  - 3. Sealant Materials: See Division 07 Section "Joint Sealants."

#### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of material for masonry restoration (face brick, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.
- B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage due to worker fatigue.
- C. Mockups: Prepare mockups of restoration and cleaning to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.
  - 1. Brick Replacement: Prepare sample areas for each type of brick indicated to be reused and/or replaced. If not otherwise indicated, size each mockup not smaller than 2 adjacent whole units or approximately 48 inches in least dimension. Erect sample areas in existing walls unless otherwise indicated, to demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:
    - a. Brick Replacement: Two brick repairs for each type of brick indicated to be repaired and/or replaced.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons.
- B. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- E. Store lime putty covered with water in sealed containers.
- F. Store sand where grading and other required characteristics can be maintained and contamination avoided.

#### 1.6 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry restoration and cleaning work to be performed according to manufacturers' written instructions and specified requirements.

- B. Repair masonry units and repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least 7 days after completion of the Work unless otherwise indicated.
- C. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.
- D. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.
- E. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least 7 days after completion of cleaning.

## 1.7 SEQUENCING AND SCHEDULING

- A. Order replacement materials at earliest possible date to avoid delaying completion of the Work.
- B. Order sand and portland cement for pointing mortar immediately after approval of Samples. Take delivery of and store at Project site a sufficient quantity to complete Project.

## PART 2 - PRODUCTS

### 2.1 MASONRY MATERIALS

- A. Face Brick: Provide face brick, including specially molded, ground, cut, or sawed shapes where required to complete masonry restoration work.
  - 1. Provide units with colors, color variation within units, surface texture, size, and shape to match existing brickwork and with physical properties as listed below:
    - a. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.

### 2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II, white or gray or both where required for color matching of exposed mortar.
  - 1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Factory-Prepared Lime Putty: ASTM C 1489.
- D. Quicklime: ASTM C 5, pulverized lime.

- E. Mortar Sand: ASTM C 144 unless otherwise indicated.
  - 1. Color: Provide natural sand of color necessary to produce required mortar color.
  - 2. For pointing mortar, provide sand with rounded edges.
  - 3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
- F. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.
- G. Water: Potable.

## 2.3 ACCESSORY MATERIALS

- A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.
  - 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. ABR Products, Inc.; Rubber Mask.
    - b. Price Research, Ltd.; Price Mask.
    - c. PROSOCO; Sure Klean Strippable Masking.
- B. Sealant Materials:
  - 1. Provide manufacturer's standard chemically curing, elastomeric sealant(s) of base polymer and characteristics indicated below that comply with applicable requirements in Division 07 Section "Joint Sealants."
  - 2. Colors: Provide colors of exposed sealants to match colors of masonry adjoining installed sealant unless otherwise indicated.
  - 3. Ground-Mortar Aggregate: Custom crushed and ground pointing mortar sand or existing mortar retrieved from joints. Grind to a particle size that matches the adjacent mortar aggregate and color. Remove all fines passing the 100 sieve.
- C. Joint-Sealant Backing:
  - 1. Refer to Specification Section 079200.
- D. Setting Buttons: Resilient plastic buttons, non-staining to masonry, sized to suit joint thicknesses and bed depths of masonry units without intruding into required depths of pointing materials.
- E. Masking Tape: Non-staining, nonabsorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints; that will easily come off entirely, including adhesive.
- F. Miscellaneous Products: Select materials and methods of use based on the following, subject to approval of a mockup:
  - 1. Previous effectiveness in performing the work involved.
  - 2. Little possibility of damaging exposed surfaces.

3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:
  - a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
  - b. Leave a residue on surfaces.

## 2.4 MORTAR MIXES

- A. Mortar Analysis: General contractor to hire a conservator to perform a mortar analysis. A conservator regularly engaged in analyzing mortar mixes shall be hired to determine mortar compatibility and identify appropriate mortar selection. The following conservators are preapproved for this type of work:
  1. J. Christopher Frey  
Keystone Preservation Group  
P.O. Box 831  
Doylestown, PA 18901  
Tel/Fax: 215-348-4919
  2. Jablonski Building Conservation  
40 West 27<sup>th</sup> street, Suite 1201  
New York, NY 10001  
Tel: 212-532-7775  
Fax: 212-532-2188  
[www.jbconservation.com](http://www.jbconservation.com)
  3. Richbrook Conservation  
P.O. Box 1061  
New York, NY 10025  
Tel: 646-315-5442  
[www.richbrook.net](http://www.richbrook.net)
- B. Substitutions: If proposed equal is submitted, lab test to establish equivalent performance levels. Use an independent testing laboratory, as determined by the Specifier, and paid for by the submitting party.
- C. Contractor shall assume that a minimum of (2) mortar analyses will be required.

## PART 3 - EXECUTION

### 3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.

1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.
- B. Prevent mortar from staining face of surrounding masonry and other surfaces.
1. Cover sills, ledges, and projections to protect from mortar droppings.
  2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
  3. Immediately remove mortar in contact with exposed masonry and other surfaces.
  4. Clean mortar splatters from scaffolding at end of each day.

### 3.2 BRICK REMOVAL AND REPLACEMENT

- A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated or are to be reused. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
1. When removing single bricks, remove material from center of brick and work toward outside edges.
- B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.
- D. Remove in an undamaged condition as many whole bricks as possible.
1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
  2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
  3. Store brick for reuse. Store off ground, on skids, and protected from weather.
  4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.
- E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.
- F. Replace removed damaged brick with other removed brick in good quality, where possible, or with new brick matching existing brick, including size. Do not use broken units unless they can be cut to usable size.
- G. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
1. Maintain joint width for replacement units to match existing joints.
  2. Use setting buttons or shims to set units accurately spaced with uniform joints.
- H. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.

1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
2. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at same time as repointing of surrounding area.
3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

### 3.3 WIDENING JOINTS

- A. Do not widen a joint, except where indicated or approved by Architect.
- B. Location Guideline: Where an existing masonry unit abuts another or the joint is less than 1/8 inch, widen the joint for length indicated and to depth required for repointing after obtaining Architect's approval.
- C. Carefully perform widening by cutting, grinding, routing, or filing procedures demonstrated in an approved mockup.
- D. Widen joint to width equal to or less than predominant width of other joints on building. Make sides of widened joint uniform and parallel. Ensure that edges of units along widened joint are in alignment with joint edges at unaltered joints.

### 3.4 CLEANING MASONRY, GENERAL

- A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.
- B. Use only those cleaning methods indicated for each masonry material and location.
  1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
  2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
    - a. Equip units with pressure gages.
  3. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.
  4. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
  5. For high-pressure water-spray application, use fan-shaped spray tip that disperses water at an angle of at least 40 degrees.
  6. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
- C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.

- D. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.
- E. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
  - 1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.
- F. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.
- G. Pointing with Mortar:
  - 1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
  - 2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
  - 3. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to featheredge the mortar.
  - 4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
  - 5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours including weekends and holidays.
    - a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
    - b. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.
  - 6. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

### 3.5 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.
  - 1. Do not use metal scrapers or brushes.
  - 2. Do not use acidic or alkaline cleaners.

- B. Wash adjacent woodwork and other non-masonry surfaces. Use detergent and soft brushes or cloths.
- C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.
- D. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

END OF SECTION 040121



## SECTION 042200 – CONCRETE UNIT MASONRY

### PART 1- GENERAL

#### 1.1 SUMMARY

- A. This section includes the following:
  - 1. Concrete masonry units.
  - 2. Mortar and grout.
  - 3. Reinforcing steel.
  - 4. Control joint materials.
  - 5. Masonry joint reinforcement.
  - 6. Ties and anchors.
  - 7. Flashing
  - 8. Miscellaneous masonry accessories.
  
- B. Related Sections:
  - 1. Division 7 Section: "Joint Sealants"

#### 1.2 REFERENCES

- A. TMS 602/ACI 530.1/ASCE 6 Specification for Masonry Structures

#### 1.3 SYSTEM DESCRIPTION

- A. Provide materials to achieve the net compressive strength of concrete unit masonry equal to or greater than 2000 psi f'm.

#### 1.4 SUBMITTALS

- A. Product Data: Submit published data from manufacturers of products and accessories specified, indicating compliance with requirements.
- B. Mix design and test reports for pre-blended mortar indicating types and proportions of materials according to proportion specification of ASTM C270.
- C. Mix design and test reports for conventional grout indicating types and proportions of materials according to proportion requirements of ASTM C476.

#### 1.5 QUALITY ASSURANCE

- A. Preconstruction Testing.
  - 1. Owner will select a qualified independent testing agency to perform preconstruction testing indicated below.
  - 2. The compressive strength of masonry shall be determined based on strength of the unit and type of mortar.
  - 3. Concrete Masonry Units: Test per ASTM C140.
  - 4. Sample Panels: Construct a panel for representation of completed masonry, joint tooling, design details, and workmanship.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means which will prevent mechanical damage and deterioration due to moisture, temperature changes, and contamination by other materials.
  - 1. Provide protection which will limit moisture absorption of concrete masonry units to the maximum percentage specified for Type I units at a relative humidity which is normal for the project site.
- B. Protect cementitious materials from precipitation and absorption of ground moisture.
- C. Store masonry accessories to prevent corrosion, dirt accumulation, and other deterioration.

## 1.7 FIELD CONDITIONS

- A. Construction Protection: Cover tops of incomplete masonry elements with waterproof sheet material at end of each workday and when masonry work is not under way.
  - 1. Secure weather protection in place with weights or by use of temporary fasteners.
  - 2. Immediately remove mortar, soil, and other such materials from exposed masonry faces to prevent staining.
- B. Loading Protection: Do not apply uniform floor or roof loads for at least 12 hours, or concentrated loads for at least 3 days, after completion of masonry elements.
- C. Cold-weather procedures when ambient temperature falls below 40°F or the temperature of masonry units is below 40°F:
  - 1. Wet or frozen units shall not be laid.
  - 2. Implement cold weather construction procedures in accordance with TMS 602/ACI 530.1/ASCE 6 Article 1.8 C.
- D. Hot-weather procedures when ambient temperature exceeds 100°F, or exceeds 90°F with a wind velocity greater than 8 mph:
  - 1. Implement hot weather construction procedures in accordance with TMS 602/ACI 530.1/ASCE 6 Article 1.8 D.

## PART 2 - PRODUCTS

### 2.1 CONCRETE MASONRY UNITS

- A. Concrete Masonry Units: ASTM C90, and as follows:
  - 1. Weight Classification: Medium weight unless otherwise indicated.
  - 2. Type I: Moisture controlled units.
  - 3. Size: Standard units with nominal face dimensions of 16 inches long and 8 inches high (15-5/8 by 7-5/8 actual), with nominal thicknesses as indicated on drawings.

4. Exposed faces: Manufacturer's standard color and texture, except where special finish is indicated on the drawings.
- B. Special shapes: Provide special block types where required for corners, control joints, headers, lintels, and other special conditions, whether or not specifically indicated on the drawings as special.
- C. Outside corners: Square-edged units except where otherwise indicated.

## 2.2 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150 Type 1.
  1. Type III may be substituted during cold-weather construction.
  2. Provide Portland cement of color required to produce approved mortar sample.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Aggregate for Mortar: ASTM C144.
- D. Grout Aggregate: ASTM C404.
- E. Pigments for Colored Mortar: Iron oxides and chromium oxides with demonstrated record of satisfactory performance in mortar mixes.
- F. Provide grout with a slump of 8 to 11 inches per TMS 602/ACI 530.1/ASCE 6 Article 2.6 B.
- G. Water: Potable.
- H. Accelerating Admixtures: Nonchloride type for cold weather mortar mixes, in proportion recommended by manufacturer.
- I. Air-entraining Admixtures: Not permitted.

## 2.3 REINFORCEMENT AND METAL ACCESSORIES

- A. Steel Reinforcing Bars: ASTM A615.
- B. Masonry Joint Reinforcement: ASTM A951 welded-wire units prefabricated into straight lengths of not less than 10 feet, with deformed continuous side rods and plain cross rods.
  1. Width: Approximately two inches less than nominal wall width, providing not less than 5/8 inch mortar coverage on exterior exposures and 1/2 inch elsewhere.
  2. Wire sizes:
    - a. Side rod diameter: 0.1875 inch.
    - b. Cross rod diameter: 0.1483 inch.
  3. Configuration:
    - a. Applications of single unit width: Truss design, diagonal cross rods at not more than 16 inches on center.
    - b. Corners: Prefabricated L- and T-shaped units.
- C. Anchors, ties, and accessories:
  1. Plate and bent-bar anchors: ASTM A36.

2. Sheet-metal anchors and ties: ASTM A1008.
  3. Wire mesh ties: ASTM A185.
  4. Wire ties and anchors: ASTM A82.
  5. Headed anchor bolts: ASTM A307, Grade A.
- D. Coatings for corrosion protection. Unless otherwise required, protect carbon steel joint reinforcement, ties, and anchors from corrosion by galvanizing or epoxy coating in conformance with the following minimums:
1. Mill galvanized coatings:
    - a. Joint reinforcement: ASTM A641 (0.1 oz/ft<sup>2</sup>)
    - b. Sheet metal anchors and ties: ASTM A653 Coating Designation G60.
  2. Hot-dipped galvanized coatings:
    - a. Joint reinforcement, wire ties, and wire anchors: ASTM A153 (1.50 oz/ft<sup>2</sup>).
    - b. Sheet metal anchors and ties: ASTM A153 Class B.

#### 2.4 MISCELLANEOUS MASONRY ACCESSORIES

- A. Rubber Preformed Control-Joint Gaskets: per ASTM D2000, Designation M2AA-805.
- B. PVC Preformed Control-Joint Gaskets: per ASTM D2287, Type PVC 654-4.
- C. Bond Breaker Strips: ASTM D 226, Type I; No. 15 asphalt felt.
- D. Sealant and Backer Rod: As specified in Division 7

#### 2.5 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures unless indicated as acceptable in the contract documents.
  1. Do not use calcium chloride in mortar or grout mixture.
- B. Mixing: Use mechanical batch mixer and comply with referenced ASTM standards.
- C. Mortar for Unit Masonry: ASTM C 270, Proportion Specification.
  1. Limit cementitious materials to lime and Portland cement.
  2. Masonry below grade and in contact with earth: Type M.
  3. Reinforced masonry and exterior above grade walls: Type S.
  4. Applications as follows: Type N.
    - a. Interior walls.
    - b. Locations for which another mortar type has not been specifically indicated.
- D. Grout: ASTM C 476; provide consistency required at time of placement to fill completely all spaces indicated to be grouted. Grout shall be either fine or coarse depending on space to be grouted. Minimum grout strength shall be 2500 psi at 28 days as measured by ASTM C1019 "Standard Method of Sampling and Testing Grout." Slump shall be a minimum of 8-inches as measured by slump cone test. Higher slump shall be provided for masonry units with high IRA (initial rate of absorption) and smaller grout spaces.

### PART 3 - EXECUTION

#### 3.3 PREPARATION

- A. Clean reinforcement and shanks of anchor bolts by removing mud, oil, or other materials that will adversely affect bond to mortar or grout.
- B. Reinforcement with rust and/or mill scale is acceptable provided attributes of a cleaned sample are in accordance with the applicable ASTM specification.
- C. Prior to laying masonry, remove laitance, loose aggregate, and any other material that would prevent mortar from bonding to the foundation.
- D. Do not wet units prior to laying.
- E. Cut units as required to fit; use motor-driven masonry saw. Install cut units with cut surfaces concealed as much as possible.

### 3.4 INSTALLATION

- A. Select and arrange units for exposed masonry to produce a uniform blend of colors and textures.
- B. Mix units from several pallets or cubes as they are placed.
- C. Comply with construction tolerances in TMS 602/ACI 530.1/ASCE 6, Article 3.3F.
- D. Construct grout spaces free of mortar dropping, debris, and any material deleterious to grouting.
- E. All masonry shall be laid true, level, plumb, and in accordance with the drawings.
- F. Ensure all vertical cells to be grouted are aligned and unobstructed openings for grout are provided.
- G. Masonry shall be laid in running bond unless otherwise indicated in the drawings.
- H. Brace masonry during construction to assure stability. Design, provide, and install bracing.

### 3.5 MORTAR BEDDING AND JOINTING

- A. Place mortar in accordance with TMS 602/ACI 530.1/ASCE 6 Article 3.3 B.
- B. Initial bed joint shall not be less than 1/4 inch nor more than 3/4 inch.
- C. All head and bed joints, except as in 3.4 B., shall be a nominal 3/8 in. thick, unless otherwise required.
- D. Lay hollow units with head and bed joints filled with mortar for the thickness of the face shell.
- E. Remove mortar protrusions extending 1/2 in. or more into cells to be grouted.
- F. Fully mortar webs in all courses of piers, columns and pilasters, in the starting course on foundations, and when necessary to confine grout.

- G. All mortar joints on exposed walls shall be concave, unless otherwise indicated, and struck to produce a dense, slightly concave surface well bonded to the surface of the masonry unit.
- H. Remove and re-lay in fresh mortar any unit that has been disturbed to the extent the initial bond is broken.
- I. Unless other conditions are specifically detailed, solidly grout cores for at least 24 inches below bearing plates, lintels, and similar features and conditions.

### 3.6 EMBEDDED ITEMS AND ACCESSORIES

- A. Construct control joints as detailed in the drawings as masonry progresses.
  - 1. Install preformed control-joint gaskets designed to fit standard block.
- B. Construct chases as masonry units are laid.
- C. Install pipes and conduits passing horizontally through masonry as indicated.
- D. Install steel lintels at all openings.
  - 1. Bearing: Provide not less than 8 inches of bearing at each jamb. Grout cells solid under bearing for full height of opening (16 inches wide).
  - 2. Reinforcement: At masonry openings greater than one foot in width, install horizontal joint reinforcement immediately below sill. Except at control joints, install opening reinforcement to extend not less than 24 inches beyond jamb on each side.
- E. Install and secure connectors, flashing, weep holes, weep vents, nailing blocks, and other accessories as required.

### 3.7 REINFORCING STEEL, WALL TIES, AND ANCHORS

- A. Install reinforcing steel, wall ties, and anchors in accordance with TMS 602/ACI 530.1/ASCE 6 Article 3.4
- B. Place reinforcement as detailed on the drawings.
  - 1. Support and fasten reinforcement at intervals not to exceed 72" to prevent displacement beyond specified tolerances during construction and grouting operations.
  - 2. Maintain clear distances between reinforcement and any interior face of masonry unit or formed surface, but not less than 1/4 in. for fine grout, or 1/2 in. for coarse grout.
  - 3. Completely embed reinforcing bars in grout.
  - 4. Provide lapped splices of 48 bar diameters minimum. Provide lap-joint tie for each splice
  - 5. Embed joint reinforcement with minimum 5/8 inch cover to faces exposed to weather or earth, and 1/2 inch elsewhere.
  - 6. Provide minimum 12-in. lap splices and ensure that all ends of longitudinal wires are embedded in mortar at laps.
  - 7. Foundation dowels that interfere with unit webs are permitted to be bent to a maximum of 1 in. horizontally for every 6 in. of vertical height.

- C. Install wall ties as detailed on the drawings and in accordance with TMS 602/ACI 530.1/ASCE 6 Article 3.4 C. Anchor masonry to structural framework at points of adjacency, and as follows:
  - 1. Maintain open space of 1 inch or more between face of framing member and masonry elements or as shown on the drawings.
  - 2. Fasten anchors to structure and embed in mortar joints as masonry is laid.
  - 3. Space anchors at maximum of 24 inches on center horizontally and 24 inches on center vertically.

### 3.8 GROUTING

- A. Comply with grout placement requirements in TMS 602/ACI 530.1/ASCE 6 Article 3.5.
- B. Place grout within 1 1/2 hr from introducing water in the mixture and prior to initial set.
- C. Grout pour height: do not exceed maximum grout pour height as given in TMS 602/ACI 530.1/ASCE 6 Table 7, or as otherwise specified.
- D. Grout lift height: Place grout in lifts not to exceed 60 inches.
- E. Grout consolidation: Consolidate grout pours by mechanical vibration and reconsolidate after initial water loss and settlement has occurred.

### 3.9 CONCEALED MASONRY FLASHING

- A. General: Install flashing at all conditions such as lintels and shelf angles, where the downward flow of water within the masonry will be interrupted, so that such water will be diverted to the exterior. Extend flashing full width at such obstructions and at least 4 inches into adjoining masonry and turn up to form watertight pan or provide pre-fabricated end dam. Remove or cover protrusions or sharp edges on substrates which could puncture flashings. Place flashings on sloped mortar bed; seal lapped ends and penetrations of flashing before covering with mortar.
  - 1. Extend metal flashings through exterior face of masonry and turn down to form drip.
  - 2. Extend fabric or laminated flashings to within 1/4 inch of exterior face of masonry.
- B. Head and Sills: Turn up ends of flashing at least 2 inches at heads and sills to form a pan, and seal joints.
- C. Sealing: Seal all joints in flashing to assure watertight integrity.
  - 1. Lap end joints on non-deformed metal flashings at least 4 inches; seal laps with elastic sealant or mastic.
  - 2. Lap end joints of flexible flashings at least 4 inches; seal in accordance with manufacturer's instructions.
- D. Weep Holes: Provide weep holes in head joints of the first course of masonry immediately above concealed flashings. Space at intervals of 24 inches on center.
- E. Reglets and Other Accessories: Install to receive flashing where indicated.

### 3.10 PARGING

- A. Mortar: Parge in two coats, using Type S or Type N mortar, to total thickness of not less than 1/2 inch.
- B. Finishing: Trowel to dense, hard surface.
- C. Curing: Damp-cure for at least 24 hours.

### 3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing agency will report inspection results promptly and in writing to Contractor and Architect
- C. Remove and replace work that does not comply with specified requirements.
- D. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

### 3.12 POINTING AND CLEANING

- A. Point and tool holes in mortar joints to produce a uniform, tight joint.
- B. During construction, minimize any mortar or grout stains on the wall. Immediately remove any staining or soiling that occurs.
  - 1. For precision or textured units, except as noted below, clean masonry by dry brushing before tooling joints.
  - 2. For burnished, glazed, or pre-finished concrete masonry units, immediately remove any green mortar smears or soiling with a damp sponge.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry surfaces of stains, efflorescence, mortar or grout droppings, and debris.
  - 1. Use appropriate masonry cleaner as tested on a sample panel, strictly following manufacturer's recommendations.
  - 2. Do not use acid based cleaning solutions.
- D. At completion of masonry work, remove all scaffolding and equipment used during construction, and remove all debris, refuse, and surplus masonry material from the site.
- E. Sprayed-on water repellent shall be applied after masonry units are cleaned and thoroughly dry in strict accordance with manufacturer's instructions.

END OF SECTION 042200

## SECTION 047200 – CAST STONE MASONRY

### PART 1 - GENERAL

#### 1.1. SECTION INCLUDES - Architectural Cast Stone.

- A. Scope - All labor, materials and equipment to provide the Cast Stone shown on architectural drawings and as described in this specification.
  - 1. Manufacturer shall furnish Cast Stone covered by this specification.
  - 2. Installing contractor shall unload, store, furnish all anchors, set, patch, clean and seal (optional) the Cast Stone as required.

#### 1.2. RELATED SECTIONS

- A. Section – 042200 Concrete Unit Masonry

#### 1.3. REFERENCES

- A. ACI 318 – Building Code Requirements for Reinforced Concrete.
- B. ASTM A 185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- C. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Reinforced Concrete.
- D. ASTM C 33 – Standard Specification for Concrete Aggregates.
- E. ASTM C 150 - Standard Specification for Portland Cement.
- F. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
- G. ASTM C 426 – Standard Test Method for Linear Shrinkage of Concrete Masonry Units
- H. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete.
- I. ASTM C 666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
- J. ASTM C 979 - Standard Specification for Coloring Pigments for Integrally Pigmented Concrete.
- K. ASTM C 1194 - Standard Test Method for Compressive Strength of Architectural Cast Stone.
- L. ASTM C 1195 - Standard Test Method for Absorption of Architectural Cast Stone.
- M. ASTM C 1364 - Standard Specification for Architectural Cast Stone.
- N. ASTM D 2244 – Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- O. Cast Stone Institute Technical Manual (Current Edition)

#### 1.4. DEFINITIONS

- A. Cast Stone - a refined architectural concrete building unit manufactured to simulate natural cut stone, used in unit masonry applications.
  - 1. Dry Cast Concrete Products – manufactured from zero slump concrete.
    - a. Vibrant Dry Tamp (VDT) casting method: Vibratory ramming of earth moist, zero- slump concrete against a rigid mold until it is densely compacted.
    - b. Machine casting method: manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it becomes densely consolidated.

#### 1.5. SUBMITTAL PROCEDURES

- A. Comply with Section 01 33 00 – Submittal Procedures.
- B. Samples: Submit pieces of the Cast Stone that are representative of the general range of finish and color proposed to be furnished for the project.
- C. Test results: Submit manufacturers test results of Cast Stone previously made by the manufacturer.
- D. Custom Package Shop Drawings: Submit manufacturer's shop drawings including profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, annotation of components, and their locations in project as indicated on the drawings.
- E. Standard Package Shop Tickets: Submit manufacturer's shop tickets including profiles, cross sections, modular unit lengths, reinforcement, exposed faces, and annotation of components proposed for use in project according to cross sections as indicated on the drawings.
- F. *Signature Series*™ Package Catalog Cuts: Submit manufacturer's catalog cuts showing page and part numbers of units proposed for use in project.

#### 1.6. QUALITY ASSURANCE

- A. Manufacturer Qualifications:
  - 1. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of Cast Stone required in accordance with the project schedule.
  - 2. Manufacturer shall submit a written list of projects similar in scope and at least five (5) years of age, along with owner, architect and contractor references.
- B. Standards: Comply with the requirements of the Cast Stone Institute Technical Manual and the project specifications. Where a conflict may occur, the contract documents shall prevail.
- C. Mock-ups: Provide mock-ups of locations listed in architectural drawings. Provide full size unit(s) for use in construction of sample wall. The approved mock-up shall become the standard for appearance and workmanship for the project.

### PART 2 - PRODUCTS

## 2.1. MANUFACTURER

- A. Basis of design Manufacturer: Corinthian Cast Stone Inc. 115 Wyandanch Ave, Wyandanch NY 11798. Phone 860-355-4905 Fax 860-633-0099 E-Mail [lbohjalian@consolidatedbrick.com](mailto:lbohjalian@consolidatedbrick.com) Web – [www.CorinthianCastStone.com](http://www.CorinthianCastStone.com)

## 2.2. ARCHITECTURAL CAST STONE

- A. Comply with ASTM C 1364
- B. Physical properties: Provide the following:
  - 1. Compressive Strength - ASTM C 1194: 6,500 psi (45 Mpa) minimum for products at 28 days.
  - 2. Absorption - ASTM C 1195: 6% maximum by the cold water method.
  - 3. Air entrainment is not required for VDT products.
  - 4. Freeze-thaw – ASTM C 1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.
  - 5. Linear Shrinkage – ASTM C 426: Shrinkage shall not exceed 0.065%.
- C. Job site testing – One (1) sample from production units may be selected at random from the field for each 500 cubic feet (14 m<sup>3</sup>) delivered to the job site.
  - 1. Three (3) field cut cube specimens from each of these samples shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as allowed by ACI 318.
  - 2. Three (3) field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.
  - 3. Field specimens shall be tested in accordance with ASTM C 1194 and C 1195.

## 2.3. RAW MATERIALS

- A. Portland cement – Type I or Type III, white and/or grey, ASTM C 150.
- B. Coarse aggregates - Granite, quartz or limestone, ASTM C 33, except for gradation, and are optional for the VDT casting method.
- C. Fine aggregates - Manufactured or natural sands, ASTM C 33, except for gradation.
- D. Colors - Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.
- E. Admixtures- Comply with the following:
  - 1. ASTM C 260 for air-entraining admixtures.
  - 2. Other admixtures: integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
  - 3. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.
- F. Water – Potable
- G. Reinforcing bars:

1. ASTM A 615/A 615M. Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 in. (37 mm).
  2. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.
- H. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as zinc plated, galvanized steel, brass, or stainless-steel Type 302 or 304.

#### 2.4. COLOR AND FINISH

- A. Match existing on site
- B. All surfaces intended to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. and the density of such voids shall be less than 3 occurrences per any 1 in.<sup>2</sup> and not obvious under direct daylight illumination at a 5 ft distance.
- C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft distance.
1. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
    - a. Total color difference – not greater than 6 units.
    - b. Total hue difference – not greater than 2 units.
- D. Minor chipping resulting from shipment and delivery is not grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 20-ft distance.
- E. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.
- F. Remove cement film, if required, from exposed surfaces prior to packaging for shipment.

#### 2.5. REINFORCING

- A. Reinforce the units as required by the drawings and for safe handling and structural stress.
- B. Minimum reinforcing shall be 0.25 percent of the cross-section area.
- C. Reinforcement shall be noncorrosive where faces exposed to weather are covered with less than 1.5 in. of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.
- D. Panels, soffits and similar stones greater than 24 in. in one direction shall be reinforced in that direction. Units less than 24 in. in both their length and width dimension shall be non-reinforced unless otherwise specified.

#### 2.6. CURING

- A. Cure units in a warm curing chamber approximately 100°F at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 70°F for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350 degree-days (i.e. 7 days @ 50°F or 5 days @ 70°F) prior to shipping. Form cured

units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

## 2.7. MANUFACTURING TOLERANCES

- A. Cross section dimensions shall not deviate by more than  $\pm 1/8$  in. from approved dimensions.
- B. Length of units shall not deviate by more than length/ 360 or  $\pm 1/8$  in., whichever is greater, not to exceed  $\pm 1/4$  in..
  - 1. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.
- C. Warp bow or twist of units shall not exceed length/ 360 or  $\pm 1/8$  in. (3 mm), whichever is greater.
- D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features – On formed sides of unit, 1/8 in. (3 mm), on unformed sides of unit, 3/8 in. maximum deviation.

## 2.8. PRODUCTION QUALITY CONTROL

### A. Testing.

- 1. Test compressive strength and absorption from specimens selected at random from plant production.
- 2. Samples shall be taken and tested from every 500 cubic feet of product produced.
- 3. Perform tests in accordance ASTM C 1194 and C 1195.
- 4. New and existing mix designs shall be tested for strength and absorption compliance prior to producing units.

## 2.9. DELIVERY, STORAGE AND HANDLING

- A. Mark production units with the identification marks as shown on the shop drawings.
- B. Package units and protect them from staining or damage during shipping and storage.
- C. Provide an itemized list of products to support the bill of lading.

## PART 3 EXECUTION

### 3.1. EXAMINATION

- A. Installing contractor shall check Cast Stone materials for fit and finish prior to installation. Do not set unacceptable units. Notify Architect if construction is not acceptable. Do not begin installation until unacceptable conditions have been corrected.

### 3.2. SETTING TOLERANCES

- A. Installation Tolerances: Comply with requirements of Cast Stone Institute Technical Manual.

1. Variation from Plumb: Do not exceed 1/8 inch in 5 feet 1/4 inch in 20 feet or more.
2. Variation from Level: Do not exceed 1/8 inch in 5 feet 1/4 inch in 20 feet, or 3/8 inch maximum.
3. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch or 1/4 of nominal joint width, whichever is greater.
4. Variation in Plane Between Adjacent Surfaces: Do not exceed 1/8-inch difference between planes of adjacent components or adjacent surfaces indicated to be flush with components.

### 3.3. JOINTING

#### A. Joint size:

1. At stone/brick joints 3/8 in.
2. At stone/stone joints in vertical position 1/4 in. (3/8 in.).
3. Stone/stone joints exposed on top 3/8 in.

#### B. Joint materials:

1. Mortar, Type N, ASTM C 270.
2. Use a full bed of mortar at all bed joints.
3. Flush vertical joints full width mortar.
4. Leave all joints with exposed tops or under relieving angles open for sealant.
5. Leave head joints in copings and projecting components open for sealant.

#### C. Location of joints:

1. As shown on shop drawings.
2. At control and expansion joints unless otherwise shown.

### 3.4. SETTING

- A. Drench Cast Stone components with clear, running water immediately before installation.
- B. Do not use pry bars or other equipment in a manner that could damage Cast Stone components.
- C. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
- D. Set Cast Stone components in a full bed of mortar, unless otherwise indicated on the drawings.
- E. Fill vertical joints with mortar.
- F. Make joints 3/8 inch, unless otherwise indicated on the drawings.
- G. Leave head joints in copings and similar components open for sealant.
- H. Rake mortar joints 3/4 inch for pointing. Sponge face of each stone to remove excess mortar.
- I. Tuck point joints to a slight concave profile.

### 3.5. JOINT PROTECTION

- A. Comply with requirements of Section 07 92 00.
- B. Prime end of units, insert properly sized backing rod and install required sealant.

3.6. REPAIR AND CLEANING

- A. Repair chips with touchup materials furnished by manufacturer.
- B. Saturate units to be cleaned prior to applying an approved masonry cleaner.
- C. Consult with manufacturer for appropriate cleaners.

3.7. INSPECTION AND ACCEPTANCE

- A. Inspect finished installation according to Bulletin #36.
- B. Do not field apply water repellent until repair, cleaning, inspection and acceptance is completed.

3.8 WATER REPELLANT

- A. Apply silane or siloxane water repellent for weatherproofing Cast Stone in accordance with manufacturer's instructions.
- B. Apply water repellent after pointing, patching, cleaning, and inspection are completed

END OF SECTION 047200



## SECTION 061000 – ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section includes the following:

1. Wood blocking and nailers
2. Wood furring
3. Wood sleepers
4. Plywood Sheathing
5. Plywood backing panels

#### 1.2 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Include data for wood-preservative and fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood
2. Fire-retardant-treated wood
3. Power-driven fasteners
4. Powder-actuated fasteners
5. Expansion anchors
6. Metal framing anchors

#### 1.3 QUALITY ASSURANCE

A. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":

1. Dimension lumber framing
2. Miscellaneous lumber

### PART 2 - PRODUCTS

#### 2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-

writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Provide dressed lumber, S4S, unless otherwise indicated.

## 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
  1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat all rough carpentry, unless otherwise indicated.
  1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
  3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.

## 2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).
  1. Use Exterior type for exterior locations and where indicated.
  2. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
  3. Use Interior Type A, unless otherwise indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Application: Treat all rough carpentry, unless otherwise indicated.
  1. Framing for raised platforms
  2. Concealed blocking
  3. Framing for non-load-bearing partitions
  4. Framing for non-load-bearing exterior walls

5. Roof construction
6. Plywood backing panels

## 2.4 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 19 percent
- B. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade of any species
- C. Framing Other Than Non-Load-Bearing Interior Partitions: No. 2 grade and any of the following species:
  1. Hem-fir (north); NLGA
  2. Douglas fir-larch; WCLIB or WWPA
  3. Spruce-pine-fir; NLGA
- D. Framing Other Than Non-Load-Bearing Interior Partitions: Any species and grade with a modulus of elasticity of at least 1,500,000 psi (10 350 MPa) and an extreme fiber stress in bending of at least 1000 psi (6.9 MPa) for 2-inch nominal (38-mm actual) thickness and 12-inch nominal (286-mm actual) width for single-member use.

## 2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  1. Blocking
  2. Nailers
  3. Rooftop equipment bases and support curbs
  4. Cants
  5. Furring
  6. Grounds
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.
- C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
  1. Mixed southern pine, No. 2 grade; SPIB
  2. Eastern softwoods, No. 2 Common grade; NeLMA
  3. Northern species, No. 2 Common grade; NLGA
  4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA

## 2.6 PLYWOOD SHEATHING

- A. Roof Sheathing: 3/4" APA CDX Plywood. C-D Exposure 1 with exterior glue.
- B. Plywood Nailers: APA CDX Plywood. C-D Exposure 1 with exterior glue. Thickness as shown on drawings.
- C. Plywood Subfloor: 3/4" APA CDX T&G Plywood. C-D Exposure 1 Tongue and Groove Edges.

## 2.7 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated

## 2.8 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified.
  - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Power-Driven Fasteners: NES NER-272
- C. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers

## 2.9 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Alpine Engineered Products, Inc.
  - 2. Cleveland Steel Specialty Co.
  - 3. Harlen Metal Products, Inc.
  - 4. KC Metals Products, Inc.
  - 5. Simpson Strong-Tie Co., Inc.
  - 6. Southeastern Metals Manufacturing Co., Inc.
  - 7. USP Structural Connectors
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

## 2.10 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
- E. Do not splice structural members between supports, unless otherwise indicated.
- F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. NES NER-272 for power-driven fasteners
  - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code
  - 3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's Uniform Building Code
  - 4. Table 2305.2, "Fastening Schedule," in BOCA's BOCA National Building Code
  - 5. Table 2306.1, "Fastening Schedule," in SBCCI's Standard Building Code
  - 6. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings
  - 7. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's International One- and Two-Family Dwelling Code

### 3.2 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000



## SECTION 061053 – MISCELLANEOUS ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

##### A. Section Includes:

1. Rooftop equipment bases and support curbs.
2. Wood blocking, cants, and nailers.

##### B. Related Sections:

1. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.

#### 1.3 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.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

### PART 2 - PRODUCTS

#### 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.

2. 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.
- B. Maximum Moisture Content of Lumber: unless otherwise indicated.

## 2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Category UC3b
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat all miscellaneous carpentry unless otherwise indicated.

## 2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
  2. Nailers.
  3. Rooftop equipment bases and support curbs.
  4. Cants.
  5. Substrate boards for roof or wall flashings.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.
- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

## 2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Where wood-preserved-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- E. Do not splice structural members between supports unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
  - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
- H. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- I. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

### 3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

### 3.3 PROTECTION

- A. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

## SECTION 062000 – FINISH CARPENTRY

### PART 1 – GENERAL

#### 1.01 DESCRIPTION OF WORK

- A. Provide all finish carpentry Work as indicated on the Drawings and as specified herein.

#### 1.02 SUMMARY

- A. Section Includes:

1. Interior trim
2. Interior plywood paneling.
3. Interior Built-In wood benches
4. Interior Custom Casework

#### 1.03 SUSTAINABILITY REQUIREMENTS

- A. Sustainability requirements included in the Section are as follows:

1. Restrictions on the use of urea-formaldehyde containing materials.

#### 1.04 REFERENCES

- A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

1. Architectural Woodwork Institute (AWI) Architectural Woodwork Quality Standards
2. American Society for Testing and Materials (ASTM) E84 Standard Test Method for Surface Burning Characteristics of Building Materials
3. American National Standards Institute (ANSI) ANSI A208.1
4. Underwriter's Laboratories, Inc. (UL)

#### 1.05 SUBMITTALS

- A. Product Data

Submit manufacturers or supplier's product data for each product and process specified as work of this Section and incorporated into items of finish carpentry.

B. Quality Certification

Submit woodwork Manufacturer's (Fabricator's) certification, stating that fabricated woodwork complies with AWI quality grades and other requirements indicated herein.

C. Wood Treatment Data

Submit chemical treatment manufacturer's instructions for handling, storing, installation, and finish of treated material.

D. Fire-Retardant Treatment

Provide certification by treating plant that treated materials comply with requirements.

E. Shop Drawings

Submit Shop Drawings showing location of each fabricated item, dimensioned plans and elevations, large scale details and profiles, attachment devices and other components.

1. Identify woodwork item using same identification system shown on Architectural Drawings.
2. Coordinate details and cut-outs to accommodate accessories specified under other Sections.

F. Samples

1. Wood Components: 12" x 12" of each type and finish (e.g., custom casework and wood benches).
2. Wood Trim: 12" length of each type and finish (e.g., base, casings, stools, aprons, chair rail).
3. Plywood Paneling: 12" x 12" for each type and finish.

G. Low Emitting Materials Compliance Submittals

1. Provide documentation for each adhesive and glue to be used on site, indicating that the adhesives comply with low V.O.C. requirements.
2. Submit manufacturer's documentation that composite wood products, including plywood, that are used are manufactured without the use of any added urea-formaldehyde. This requirement includes binders, and laminating adhesives used in the field or shop. Submit manufacturer's documentation of the resin(s).

1.06 QUALITY ASSURANCE

A. AWI Quality Standard

Comply with applicable requirements of the AWI "Architectural Woodwork Quality Standards", except where indicated otherwise.

B. Fabrication and Installation Qualifications

Firm which can demonstrate a minimum of 5 years of successful experience in fabricating and installing woodwork items similar in type and quality to those required for this project.

- C. Submit name of firm to the Authority for approval.
- D. Regulatory Agencies

Fire-retardant treated wood shall be certified by one of the following:

- 1. National Recognized Testing Agency
  - 2. OTCR
- E. All plywood, composite wood products and laminating adhesives used shall contain no added urea-formaldehyde.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver woodwork until operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If woodwork must be stored, store only in areas meeting requirements and conditions specified for installation areas.

#### 1.08 PROJECT CONDITIONS

- A. Conditioning

Woodwork Installer shall advise the Construction Manager of temperature and humidity requirements, in writing for woodwork installation and storage areas. Do not install woodwork until required temperature and relative humidity have been stabilized.

- B. Maintain temperature and humidity conditions in installation area as required to maintain moisture content of installed woodwork within 1.0 percent of optimum moisture content as follows:
  - 1. Optimum moisture content of wood: 5-10%
  - 2. Relative humidity required to be maintained in installation and storage areas: 25-55%

### PART 2 - PRODUCT

#### 2.01 MATERIAL

- A. General

- 1. All interior wood finish shall be made up of thoroughly seasoned, kiln dried

woods of the kinds specified.

2. All material shall be clear on all exposed faces and edges, free from checks, cracks or other blemishes that would mar the appearance of the finished wood.
3. In assembling interior woodwork, arrange so that variations in grain pattern are kept to a minimum.
4. All material shall be product of one mill.
5. All plywood and laminating adhesives used shall contain no added urea-formaldehyde.

B. Species and Grades (Lumber)

1. W-1: Plain Sawn Red Oak, AWI Grade A1 (for transparent finish): all interior wood finish in Lobby, except as otherwise specified or shown on Drawings.

C. Species, Grades, Types (Plywood)

1. Veneer: Red Oak, as specified herein, AWI Grade A1.
2. Grain Appearance: Running Match.

2.02 FABRICATION, GENERAL

A. Wood Moisture Content

Comply with requirements of referenced quality standard for moisture content of lumber at time of fabrication and for relative humidity in installation areas. (See Art. 1.07).

B. Fabricate woodwork to dimensions, profiles, and details indicated.

C. Complete fabrication, assembly, finishing, and other work before shipment to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary, provide ample allowance for scribing, trimming, and fitting.

D. Pre-Cut Openings

Provide woodwork with pre-cut openings, where possible, for hardware, appliances, plumbing fixtures, electrical work and similar items. Locate openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth edges of cutouts.

E. Measurements

Before fabrication of woodwork to be fitted to other construction, obtain field measurements and verify dimensions and shop drawings detail as required for accurate fit.

1. Where field measurements before fabrication would delay the project, fabricate without field measurements and provide ample borders and edges to allow for scribing and trimming of woodwork.

2.03 FIRE-RETARDANT MATERIALS

Mount Pleasant CSD/Physical  
Education Department Renovations  
at Westlake High School  
NYSSED #66-08-01-06-0-005-020

062000-4

#4.1449.08

- A. Where fire-retardant treated lumber, plywood, and panel products are required by Building Code or indicated on the drawings, provide materials which are pressure impregnated with fire-retardant chemicals and comply with the following requirements:
1. Fire-Retardant Chemicals: Use chemicals which do not bleed through or otherwise adversely affect adhesives or finishes. Do not use colorants to distinguish treated lumber and panels from untreated lumber and panels.
- B. Fire-Performance Characteristics
- Provide materials which are identical to those tested in accordance with ASTM methods and time periods indicated, are listed for fire performance characteristics by Underwriter's Laboratories, Inc., or other testing agency acceptable to authorities having jurisdiction.
1. Marking: Identify treated lumber with separable paper classification marking of inspecting and testing agency.
  2. Surface Burning Characteristics: Not exceeding values indicated below, tested in accordance with ASTM E84 for 30 minutes which no evidence of significant combustion.
    - a. Flame Spread: 25.
    - b. Smoke Developed: 50.
- C. Kiln-dry woodwork after treatment to levels required for non-fire-retardant woodwork materials. Maintain moisture content required by kiln drying, before and after treatment. Do not use treated lumber which does not comply with requirements of referenced woodworking standard.
- D. Where fire-retardant particleboard and fiberboard are used, provide panels with fire-retardant chemicals to achieve surface-burning characteristics of 20 for flame spread and 25 for smoke developed when tested in accordance with ASTM E84.

Comply with ANSI A208.1 for Grade M-1 panels. Minimum density 40 lbs./cu. ft.

Linear expansion: Maximum average 0.35%.

## 2.04 LUMBER THICKNESS

- A. Finish thicknesses of members, and tolerances permitted:

Comply with AWI Section 3, 4.2.1.

## 2.05 GLUING

- A. Gluing for wood member thickness and for wood member width

Comply with AWI- Section 3, 4.2a.

## PART 3 - EXECUTION

### 3.01 CONDITION OF SURFACES

- A. Examine all grounds, stripping and blocking, to secure paneling and other items provided under this Section.
- B. Do not install until all defects are corrected.

### 3.02 INSTALLATION

- A. Install woodwork plumb and level without distortion.
- B. Shim as necessary with concealed shims.
- C. Accurately scribe and closely fit all face plates, filler strips and trim strips to irregularities of adjacent surfaces.
- D. Do all Work in strict accordance with the details for the various portions of the Work.
- E. For adjoining pieces of hardboard, carefully select to match the color and grain as closely as possible.
- F. Interior finish  
  
High-speed machine work, free from planing machine marks, sandpapered smooth, ready to receive paint or varnish.
- G. Carefully fit woodwork and secure with finishing nails; countersink nails.
- H. Do not allow kerfing on faces of trim or moldings.
- I. Properly house stiles and rails into framework and properly nail and glue all parts together.
- J. Miter, with miters doweled or clamped, all trim joints except window trim.
- K. Round base and all other moldings on walls at all salient angles; where columns occur in partitions, follow contour.
- L. Install all trim, when applied to a surface less than 13 feet in length, in one length: no piecing will be accepted. Provide bevel joints, where joints are required; no butt joints will be accepted.
- M. In addition to machine sanding, sand all interior woodwork by hand with 00 sandpaper to give trim a smooth surface for finishing.

### 3.03 APPLYING HARDWARE

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

1. Where finish carpentry materials are exposed, provide fasteners and anchorages with a black matt finish or as approved by AOR.
- B. Apply all miscellaneous hardware not specified to be installed under Section 087100 and other Sections.

LIST OF SUBMITTALS

SUBMITTAL	DATE SUBMITTED	DATE APPROVED
Product Data:	_____	_____
1. Manufacturer's or supplier's product data for each product and process		
Quality Certification:	_____	_____
1. Compliance with AWI quality grades and other requirements		
Wood Treatment Data:	_____	_____
1. Chemical treatment manufacturer's instructions		
Fire-Retardant Treatment:	_____	_____
1. Certification by plant.		
2. Certification of approval by Nationally Recognized Testing Agency		
Shop Drawings:	_____	_____
1. Location of each fabricated item		
2. Dimensioned plans and elevations		
3. Large scale details and profiles		
4. Attachment devices and other components		
Samples:	_____	_____
1. Wood Components - For each species and cut of lumber and panel products with non-factory-applied finish, with 1/2 of exposed surface finished, 12 by 12 inches for panels		
2. Wood Trim - 12" length of each type and finish (e.g., base, casings, stools, aprons, chair rail)		
3. Plywood Paneling - 12" x 12" for each type and finish		

Quality Assurance:

\_\_\_\_\_

1. Certification of experience

Project Conditions:

\_\_\_\_\_

1. Temp. and humidity reqmt's.  
for storage and installation

Sustainability:

\_\_\_\_\_

1. Manufacturer's documentation  
that composite wood products  
contain no added urea-  
formaldehyde. Document binder used.
2. Manufacturer's documentation  
that laminating adhesives,  
both field and shop applied,  
contain no added urea-formaldehyde  
Document binder used.

END OF SECTION 062000

## SECTION 066116 – SOLID SURFACING FABRICATIONS

### PART 1 - GENERAL

#### 1.01 DESCRIPTION

A. Work described in this section:

1. Window sills
2. Built-in countertops

B. Related work specified elsewhere:

1. Aluminum Windows – 085113

#### 1.02 REFERENCES

A. Applicable Standards: Standards of the following, as referenced herein:

1. American National Standards Institute (ANSI)
2. American Society for Testing and Materials (ASTM)
3. National Electrical Manufacturers Association (NEMA)
4. Federal Specifications (FS)

#### 1.03 SUBMITTALS

- A. Shop drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.
- B. Samples: Submit minimum 2" x 2" samples. Indicate full range of color and pattern variation. Approved samples will be retained as standards for work.
- C. Product data: Indicate product description, fabrication information and compliance with specified performance requirements.
- D. Maintenance data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project close-out documents.

#### 1.04 QUALITY ASSURANCE

A. Allowable tolerances:

1. Variation in component size:  $\pm 1/8"$ .
2. Location of openings:  $\pm 1/8"$  from indicated location.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver no components to project site until areas are ready for installation. Store components indoors prior to installation.

1.06 WARRANTY

- A. Provide manufacturer's 10 year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

PART 2 - PRODUCTS

2.01 SOLID POLYMER FABRICATIONS

- A. Preferred products:
  1. du Pont de Nemours & Co. Inc, Corian
  2. AYONITE
  3. SUREAL
- B. Material: Homogeneous filled acrylic; not coated, laminated or of composite construction; meeting ANSI Z124.3 & .6, Type Six, and Fed. Spec. WW-P-541E/GEN.
  1. Material shall have minimum physical and performance properties specified in the following Section U.
  2. Superficial damage to a depth of 0.010" shall be repairable by sanding and polishing.
- C. Counter Top: 1" thick solid polymer material, adhesively joined with inconspicuous seams; edge details as indicated on the Architect's Drawings; white color. [Technical Bulletin: 130].
- D. Performance characteristics:

PROPERTY	REQUIREMENT	TEST PROCEDURE
	(min or max)	
Tensile Strength	5000 psi min	ASTM D638
Tensile Modulus	1.0 x 10 <sup>0</sup> psi min	ASTM D638
Flexural Strength	7000 psi min	ASTM D790
Flexural Modulus	1.0 x 10 <sup>0</sup> psi min	ASTM D790
Elongation	0.3% min.	ASTM D638
Hardness	90-Rockwell "M" scale min. 52-Barcol Impresser min.	ASTM D758 ASTM D2583
Thermal Expansion	3.5 x 10 <sup>-6</sup> in/in/deg C. max. 1.95 x 10 <sup>-6</sup> in/in/deg F. max.	ASTM D696
Color Stability	No change, 100 hours min.	NEMA LD3-3.10
Wear and Cleanability	Passes	ANSI Z124.3
Abrasion Resistance	No loss of pattern max. weight loss (1000cycles) =0.9g.	NEMA LD3-3.01      ANSI Z124.3
Boiling water Surface Resistance	No Change	NEMA LD3-3.05
High Temperature Resistance	No Change	NEMA LD3-3.06
Impact Resistance Notched Izod Gardner	0.24 ft.-lbs.min. 9.0 ft-lbs min.	ASTM D256, Method A ASTM D3029

Ball drop 1/4" sheet 1/2" sheet 3/4" sheet	36" min, 1/2 lb ball, no failure 140" min, 1/2 lb ball, no failure 200" min, 1/2 lb ball, no failure		NEMA LD3-303	
Bowls (point impact)	No cracks or chips		ANSI Z124.3 and 124.6	
Stain Resistance	Passes		ANSI Z124.3	
Weatherability	No change,min. 1000 hours		ASTM D1499	
Fungi and Bacteria	No Attack		ASTM G21, ASTM G22	
Specific Gravity	1.6 min			
Water Absorption Weight (% max.)	24 hrs. 0.05 0.10	Long Term 0.50(1/4") 0.90(3/4")	ASTM D570	
Flammability	ASTM E84			
		solid colors		
	1/4"	1/2"	3/4"	
Flame spread	25 max	25 max	25 max	
Smoke Developed	30 max	30 max	30 max	
Class	1	1	1	
		particulate patterns		
	1/4"	1/2"	3/4"	
Flame spread	25 max	25 max	25 max	
Smoke Developed	30 max	30 max	30 max	
Class	1	1	1	
Pittsburgh Protocol Toxicity (as used by NY State)	solids-80 gms minimum rating patterns-65 gms minimum		"LC50" Test	

## 2.02 ACCESSORY PRODUCTS

- A. Joint adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints, with a chemical bond. (Technical Bulletin: CTDC 102)
- B. Sealant: Manufacturer's standard mildew-resistant, FDA/UL® recognized silicone sealant in color matching or clear formulations. (Technical Bulletin: 102, 127)

## 2.03 FABRICATION

- A. For warranty coverage, fabricator/installer shall be approved by solid polymer manufacturer.
- B. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and solid polymer manufacturer requirements.
- C. Provide holes and cutouts for plumbing and bath accessories as indicated on the drawings.
- D. Rout and finish component edges to a smooth, uniform finish. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

E. Finish: All surfaces shall have uniform finish.

1. Matte, with a gloss rating of 5 - 20.

### PART 3 - EXECUTION

#### 3.01 JOB MOCK-UP

- A. Prior to final approval of shop drawings, erect one full size mock-up of each component at project site for architect review.
- B. Should mock-up not be approved, rework or remake until approval is secured. Remove rejected units from project site.
- C. Approved mock-ups shall remain as part of finished work.

#### 3.02 INSTALLATION

- A. Install components plumb and level, in accordance with approved shop drawings and product installation details.
- B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.
- C. Provide backsplashes and end splashes as indicated on the drawings. Adhere to countertops using manufacturer's standard color-matched silicone sealant.
- D. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Components shall be clean on Date of Substantial Completion.
- E. Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged work that cannot be repaired to architect's satisfaction and invoice for the cost of repairs. Architect to pre-approve cost estimate before repairs are made.

END OF SECTION 066116

## SECTION 078443 – FIRESTOPPING

### PART 1 - GENERAL

1.1 Applicable provisions of the Conditions of the Contract and Division #1, General Requirements, govern work in this Section.

#### 1.2 DESCRIPTION OF WORK

A. The work of this Section consists of the provision of all materials, labor and equipment and the like necessary and/or required for the complete execution of all firestopping and smoke seal work for this project as required by the schedules, keynotes and drawings, including, but not limited to the following:

NOTE: Firestopping is defined as a material, or combination of materials, to restore the integrity of fire rated walls and floors by maintaining an effective barrier against the spread of flame, smoke and toxic gases and further defined in 1.4 below.

1. Provide firestopping and smoke seals as indicated on the drawings and/or required to maintain full and continuous smoke and fire barrier between zones including:
  - a. Through penetration firestops and smoke-stops for all fire-rated bearing and non-bearing wall and floor assemblies, both blank (empty) and those accommodating penetrating items such as cables, conduits, pipes, ducts, etc.

NOTE: A preinstallation conference shall be scheduled by the Contractor with this Specialty Contractor and all other Specialty Contractors, Subcontractors and the like to establish procedures to maintain optimum working conditions and to coordinate the work of this Section with related and adjacent work.

#### 1.3 RELATED WORK SPECIFIED ELSEWHERE – Entire Project Specification

NOTE: Proper execution of this work will maintain the hourly ratings of the walls and floors and ensure progress of work in other Sections as listed below.

#### 1.4 QUALITY ASSURANCE

A. Firestopping systems (materials and design):

1. Shall conform to both Flame (F)P and Temperature (T) ratings as required by local building codes and as tested by nationally accepted test agencies per ASTM E 814 or UL 1479 fire tests in a configuration that is representative of field conditions.
2. The F rating must be a minimum of 1 hour but not less than the fire resistance rating of the assembly being penetrated.

3. T rating when required by code authority shall be based on measurement of the temperature rise on penetrating item(s).
  4. The fire test shall be conducted with a minimum positive pressure differential of 0.03 inches of water column.
  5. For joints, must be tested to UL 2079 or E 1399 and E 1966 with movement capabilities equal to those of the anticipated conditions.
  6. Where there is no specific third party tested and classified firestop system available for a particular firestop configuration, the firestopping contractor shall obtain from the firestop manufacturer an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) for submittal.
- B. Firestopping materials and systems must be capable of closing or filling through-openings created by 1) the burning or melting of combustible pipes, cable jacketing, or pipe insulation materials, or 2) deflection of sheet metal due to thermal expansion (electrical and mechanical duct work).
- C. Firestopping sealants must be flexible, allowing for normal pipe movement.
- D. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces.
- E. Firestopping materials shall be moisture resistant and may not dissolve in water after curing.
- F. For firestopping exposed to view, traffic, moisture, and physical damage, provide appropriate firestop systems for these conditions.
- G. All firestopping materials shall be manufactured by one manufacturer (to the maximum extent possible).
- H. Material used shall be in accordance with the manufacturer's written installation instructions.
- I. Firestopping shall be performed by a Specialty Contractor trained or approved, in writing, by firestop material manufacturer. Said specialist shall be as defined in the Conditions. Equipment used shall be in accordance with firestop material manufacturer's written installation instructions.
- J. Materials shall conform to all applicable governing codes.
- K. All materials used in the work shall be certified "asbestos free" and shall be free from any and all solvents or components that require hazardous waste disposal or, that after curing, dissolve in water.
- L. All materials shall comply with the interior finish flame spread and smoke developed requirements for the area in which they are installed. Coordinate with governing codes.
- M. DEFINITIONS
1. FIRESTOPPING: The use of a material or combination of materials in a fire-rated structure (wall or floor) where it has been breached, so as to restore the integrity of

the fire rating on the wall or floor.

2. **SYSTEM:** The use of a specific firestop material or combination of materials in conjunction with a specific wall or floor construction type and a specific penetrant(s), constitutes a "system".
3. **BARRIER:** Any bearing or non-bearing wall or floor that has an hourly fire and smoke rating.
4. **THROUGH-PENETRATION:** Any penetration of a fire-rated wall or floor that completely breaches the barrier.
5. **MEMBRANE-PENETRATION:** Any penetration in a fire-rated wall that breaches only one side of the barrier.
6. **CONSTRUCTION GAPS:** Any gap, joint, or opening, whether static or dynamic, where the top of a wall may meet a floor; wall to wall applications; edge to edge floor configurations; floor to exterior wall; or any linear breach in a rated barrier. Where movement is required, the firestopping system must comply with UL2079 for dynamic joints.

## 1.5 SUBMITTALS

**NOTE:** A "Certificate of Conformance", from the manufacturer listed in Part 2, is required with the "Submittal Package" to ensure that the material selected meets all of the criteria of this specification as set forth in Paragraph 1.4 of this Section.

- A. Submit manufacturer's product literature for each type of firestop material to be installed. Literature shall indicate project characteristics, typical uses, performance and limitation criteria, and test data. Submittal should be in compliance with Section 013300.
- B. **UL Tested Systems:** Submit drawings showing typical installation details for the methods of installation. Indicate which firestop materials will be used and thickness for different hourly ratings.
- C. **Engineering Judgments:** Submit manufacturer's drawings for all non-standard applications where no UL tested system exists. All drawings must indicate the "Tested" UL system upon which the judgment is based so as to assess the relevance of the judgment to some known performance.
- D. Submit manufacturer's installation procedures for each type of product.
- E. **Approved Applicator:** Submit document from manufacturer where in manufacturer recognizes the installer as a qualified or submit a list of past projects to demonstrate capability to perform intended work.
- F. Upon completion, installer shall provide written certification that materials were installed in accordance with the manufacturer's installation instructions and details.
- G. **Mockups:**
  1. Prepare job mockup of the material proposed for use in the project as directed by

Architect. Approved mockups shall be left in place as part of the finished project and will constitute the standard for remaining work, including aesthetics.

- H. Manufacturers Material Safety Data Sheet (MSDS) must be submitted for each manufactured product.

#### 1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials to be used in the work of this section to the project site in original sealed containers with manufacturer's brand and name, lot numbers, UL labeling, mixing and installation instructions clearly identified thereon.
- B. Store all materials in accordance with manufacturer's directions from the project site at the contractor's expense if date is expired.

#### 1.7 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
  - 1. E 814 – Standard Method of Fire Tests of Through Penetration Fire Stops.
  - 2. E 119 – Methods of Fire Tests of Building Construction and Materials.
  - 3. E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 4. E 136 – Test Method for Behavior of Materials in a Vertical Tube Furnace at 750F.
  - 5. E 1399 – Cyclic Movement and Measuring Minimum and Maximum Joint Widths.
  - 6. E 1966 – Test Method for Resistance of Building Joint.
  - 7. E 2174 – Standard Practice for On-Site Inspection of Installed Fire Stops.
  - 8. E 05.11.14 – Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale, Multi Story Test Apparatus (ISMA); ASTM permanent number assignment pending approval of Draft.
- B. Underwriters Laboratories, Inc. (UL)
  - 1. UL 1479 – Fire Tests of Through Penetration Fire Stops.
  - 2. UL 263 – Fire Tests of Building Construction and Materials.
  - 3. UL 723 – Surface Burning Characteristics of Building Materials.
  - 4. UL 2079 – Tests for Fire Resistance of Building Joint Systems.

5. UL "Fire Resistance Directory", current year, including but not limited to the following:
    - a. For penetrations by uninsulated, non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT) – UL System: CAJ1235, CAJ1404, WL1152.
    - b. For penetrations by insulated, non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EAMT) – UL System: CAJ5222, CAJ5250, CAJ5251, WL5171.
    - c. For penetrations by PVC jacketed, flexible cable or cable bundles and plastic pipe (closed piping systems) – UL System: CAJU2401, CAJ3185, CAJ3199, CAJ3234, WL3118, WL3179, WL3199.
    - d. For penetrations by combustible plastic pipe (open piping systems) – UL System: CAJ2174, CAJ2339, CAJ2351, CAJ2432, WL2168, WL2170, WL2185, WL2259.
    - e. For penetrations by multiple combustible and/or non-combustible items – UL System: CAJ8101, CAJ8133, WL8007.
    - f. For large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways – UL System: CAJ1406, CAJ1502, CAJ4053, CAJ6027, WJ6004, WL1207, WL1343, WL4030, WL6018.
    - g. For penetrations by steel ducts – UL System: CAJ7075, CAJ7082, WJ7045, WL7046, WL7006, WL7046, WL7081, WL7082.
    - h. For fire-rated construction joints and other gaps – OPL System: CEJ296P, CEJ302P.
  6. For openings between structurally separate sections of wall and floors. At the top of walls – UL System: HWD0107, HWD0110, HWD0257, HWD0267, HWD0299, HWD0327, HWD0266, HWD 0333, HWD0334.
- C. Factory Mutual (FM) Approval Guide, current year.
1. FM Approval Standard of Firestop Contractors – Class 4991.
- D. Building code of the jurisdiction of the Work.
- E. National Fire Protection Association
1. NFPA 101 – Life Safety Code.
  2. NFPA 70 – National Electrical Code.
  3. NFPA 221 – Fire Walls and Fire Barriers (preliminary to be released).
  4. NFPA 251 – Fire Tests of Building Construction and Materials
- F. FICA "Manual of Practice".

- G. Certification of "DRI" employee(s).
- H. International Firestop Council (IFC):
  - 1. Ref. 1 Recommended IFC Guidelines for Evaluating Firestop Engineering Judgments (April 2001)
  - 2. Ref. 2 Inspectors Field Pocket Guide

## 1.8 PROJECT CONDITIONS

- A. Conform to manufacturer's printed instructions for installation and when applicable, curing in accordance with temperature and humidity. Conform to ventilation and safety requirements.
- B. Coordinate work required with work of other trades; firestopping shall, where practical, precede gypsum board or other applied sheet finishing operations.
- C. Where firestopping is installed at locations which will remain exposed in the finished work, provide protection as necessary to prevent damage to adjacent surfaces and finishes, and protect as required against damage from other construction operations.

## 1.9 SEQUENCING

- A. Schedule firestopping after installation of penetrants but prior to concealing the openings.

## 1.10 PROTECTION

- A. Where firestopping is installed at locations which will remain exposed in the completed work, provide protection as necessary to prevent damage to adjacent surfaces and finishes, and protect as necessary against damage from other construction activities.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Firestopping materials and systems shall meet the requirements specified herein.
- B. Architect must approve in writing any alternates to the materials and systems specified herein.
- C. All firestop products and systems shall be designed and installed so that the basic sealing system will allow the full restoration of the thermal and fire resistance properties of the barrier being penetrated with minimal repair if penetrants are subsequently removed.
- D. For applications where combustible penetrants are involved, i.e., insulated and plastic

pipe, a suitable intumescent material must be used.

2.2 SPECIFIED STANDARD: For purposes of establishing standards of quality and levels of performance and not for the purposes of limiting competition, the basis of this specification is upon units as manufactured by one of the following and their respective model suitable for the intended application.

- A. Hilti, Inc.
- B. Specified Technologies, Inc.
- C. Grace / IPC Corp.
- D. Nelson Firestop Products
- E. Tremco, Inc.
- F. U.S. Gypsum Company
- G. Johns Manville

2.3 PRODUCTS SHALL GENERALLY INCLUDE:

- A. Cast-In-Sleeves (3M CID).
- B. Mortar seals.
- C. Fire stop design sealant compounds, caulk and foam systems.
- D. Putty and putty pads.
- E. Firestop kits including collars, plugs, etc.
- F. Seal bags.
- G. Tapes and blankets.
- H. Intumescent design wrap strips.
- I. Mineral type unfaced safing insulation with third party wrap, 3.5 pcf density, UL R-10905 label.

2.4 ACCESSORY ELEMENTS

- A. Forming, damming materials shall be mineral fiber board or other suitable material recommended by nominated system manufacturer.
- B. Primers, sealant and solvent cleaners shall be as recommended by the nominated system manufacturer.

- C. Metal Systems – 20 gauge phosphatized, electro-galvanized steel plate and/or galvanized steel clips.

2.5 Balance of materials shall be as specified elsewhere in this Section.

## PART 3 – EXECUTION

### 3.1 INSPECTION AND ACCEPTANCE

- A. Examine all surfaces and contiguous elements to receive work of this section and correct, as part of the Work of this Contract, any defects affecting installation. Commencement of work will be construed as complete acceptability of surfaces and contiguous elements.
- B. Verify the environmental conditions are safe and suitable for installation of firestop products.
- C. Verify that all pipe, conduit, cable, and other items which penetrate fire-rated construction have been permanently installed prior to installation of firestops.

### 3.2 PREPARATION

- A. The surface shall be dry, clean, and free of all foreign matter. Do not apply firestopping to surfaces previously painted or treated with a sealer, curing compound, water repellent or other coatings unless tests have been performed to ensure compatibility of materials.
- B. Provide primers as required which conform to manufacturer's recommendations for various substrates and conditions.
- C. Mask where necessary to protect adjoining surfaces.
- D. Remove excess material and stains on surfaces as required.

### 3.3 INSTALLATION – GENERAL SYSTEMS

- A. Install in strict accordance with manufacturer's printed instructions as well as UL guidelines and state and local fire codes.
- B. Ensure that anchoring devices, backup materials, clips, sleeves, supports and other materials used in the actual fire test are installed.
- C. Install firestopping with sufficient pressure to properly fill and seal openings to ensure an effective smoke seal.
- D. Tool or trowel exposed surfaces. Remove excess firestop material promptly as work progresses and upon completion.
- E. Install dams when required to properly contain firestopping materials within openings and as required to achieve required fire resistance ratings. Combustible damming materials

must be removed after appropriate curing. Incombustible damming materials may be left as a permanent component of the firestopping system.

### 3.4 PENETRATION SEALS

- A. Penetrations are defined as conduits, cables, wires, piping, ducts or other elements passing through one or both outer surfaces of fire rated walls, floors or partitions and shall be firestopped on both sides of penetration in accordance with requirements set forth in Paragraph 1.4 of this Section.
- B. Where sleeves are used, same shall be as specified in Part 2 herein; in event that sleeves are not used, core openings and caulk or wrap penetrating items with intumescent system the full length of penetration and seal on both sides with intumescent caulk. Residual openings within square or rectangular holes shall be filled with compounds applicable for substrate encountered and all penetrations sealed on both sides with caulk.

### 3.5 FIELD QUALITY CONTROL

- A. Contractor shall immediately notify the Architect if the firestopping systems herein specified cannot meet the requirements of the specification.
- B. Contractor shall examine firestops to ensure proper installation and full compliance with this specification.
- C. All areas of work must be accessible until inspection by the applicable Code authorities.
- D. Correct unacceptable firestops and provide additional inspection to verify compliance with this specification at no additional cost.

### 3.6 IDENTIFICATION

- A. Identify firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
  - 1. The words: "Warning—Firestop System—Do Not Disturb. Notify Building Management of Any Damage."
  - 2. Contractor's name, address, and phone number.
  - 3. Firestop system designation of applicable testing and inspecting agency.
  - 4. Date of installation.
  - 5. Firestop system manufacturer's name.
  - 6. Installer's name.

### 3.7 CLEANING

- A. When finished work will be visible, clean adjacent surfaces in accordance with manufacturer's printed instructions.
- B. If visible in the finished work, remove temporary dams after initial cure of firestops.
- C. Correct staining and discoloring on adjacent surfaces.
- D. Remove all debris and excess materials entirely from site and leave work in a neat and clean condition.

### 3.8 FIRESTOP SYSTEM SCHEDULE

- A. The following schedules shall be completed by the Contractor and reviewed prior to submission to the Architect. The untitled table included shall be completed with each of the following categories of penetrating items.
  - 1. Single uninsulated metallic piping and conduit.
  - 2. Multiple uninsulated metallic piping and conduit.
  - 3. Uninsulated plastic piping and conduit.
  - 4. Insulated metallic piping.
  - 5. Electrical cable.
  - 6. Bus duct.
  - 7. Miscellaneous penetrations.
- B. Complete the additional tables for the following using the format provided.
  - 1. Blanks, voids, holes.
  - 2. Engineering judgments.
  - 3. Ductwork engineering judgments.

### 3.09 WASTE MANAGEMENT

- A. Separate and recycle materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
- B. Set aside and protect materials suitable for reuse and/or remanufacturing.
- C. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

PENETRATING ITEM:

Manufacturer/Product Name:

Color:

Accessories:

Floor/Wall Construction	Item Size/Description	Sleeve	F Rating	T Rating	Annular Space	Firestop Thickness	Tested Ass'y No.

BLANKS, VOIDS, HOLES:

Manufacturer/Product Name:

Color:

Accessories:

Floor/Wall Construction	Size/Description	F Rating	T Rating	Firestop Thickness	Tested Ass'y No.

**ENGINEERING JUDGMENTS** (Submit Actual Installation Drawing and Letter of Certification)

Manufacturer/Product Name:

Color:

Accessories:

Floor/Wall Construction	Item/Size Description	F Rating	T Rating	Annular Space	Firestop Thickness	Packing Thickness

**DUCTWORK ENGINEERING JUDGMENTS** (Submit Actual Installation Drawing and Letter of Certification)

Manufacturer/Product Name:

Color:

Accessories:

Wall/FI Construction	Size	Fire Damper	F	T	Annular Space Range	Firestop Thickness	Packing Thickness

END SECTION 078443

## SPECIFICATION – 079000 PRE-COMPRESSED EXPANSION JOINTS

### PART 1 – GENERAL

#### 1.01 Work Included

- A. The work shall consist of furnishing and installing waterproof expansion joints in accordance with the details shown on the plans and the requirements of the specifications. Preformed sealant shall be silicone pre-coated, preformed, pre-compressed, self-expanding, sealant system.
- B. Related Work
  - Division 4 - Masonry
  - Division 7 – Joint Sealants

#### 1.02 Submittals

- A. General – Submit the following according to Division 1 Specification Section.
- B. Standard Submittal Package – Submit typical expansion joint drawing(s) indicating pertinent dimensions, general construction, expansion joint opening dimensions and product information.
- C. Sample of material is required at time of submittal.
- D. All products must be certified by independent laboratory test report to exceed the requirements of curtain wall performance tests ASTM E330, E283-04, and E331. Product must meet or exceed hurricane-force wind loading with no deflection at both positive and negative pressures up to 4954 Pascals—equal to 200 mph winds (ASTM E330-02-procedure A).
- E. All products must be certified by independent laboratory test report to ASTM E90-09 and to meet or exceed an STC 52 in STC 56 wall and OITC 38 rating in an OITC 38 wall.
- F. All products must be certified by independent laboratory test report to be free in composition of any waxes or wax compounds using FTIR and DSC testing.
- G. All products shall be certified in writing to be: a) capable of withstanding 150°F (65°C) for 3 hours while compressed down to the minimum of movement capability dimension of the basis of design product (-50% of nominal material size) without evidence of any bleeding of impregnation medium from the material; and b) that the same material after the heat stability test and after first being cooled to room temperature will subsequently self-expand to the maximum of movement capability dimension of the basis-of-design product (+50% of nominal material size) within 24 hours at room temperature 68°F (20°C).
- H. Quality and Environmental control: Manufacturer shall be certified to both ISO-9001:2015 (quality management) and ISO-14001:2015 (environmental management) and shall provide written confirmation that formal Quality and Environmental management systems and processes have been adopted.

#### 1.03 Product Delivery, Storage and Handling

Mount Pleasant CSD/Physical  
Education Department Renovations  
at Westlake High School  
NYSSED #66-08-01-06-0-005-020

079000-1

#4.1449.08

- A. Deliver products to site in Manufacturer's original, intact, labeled containers. Handle and protect as necessary to prevent damage or deterioration during shipment, handling and storage. Store in accordance with manufacturer's installation instructions.

#### 1.04 Basis of Design

- A. All joints shall be designed to meet the specified performance criteria of the SEISMIC COLORSEAL product as manufactured by: (USA & International) EMSEAL JOINT SYSTEMS, LTD 25 Bridle Lane, Westborough, MA 01581-2603, Toll Free: 800-526-8365.  
(Canada) EMSEAL, LLC 120 Carrier Drive, Toronto, Ontario, Canada M9W 5R1 Toll Free: 800-526-8365. www.emseal.com
- B. Alternate manufacturers must demonstrate that their products meet or exceed the design criteria and must submit certified performance test reports performed by nationally recognized independent laboratories as called for in section 1.02 Submittals. Submittal of alternates must be made three weeks prior to bid opening to allow proper evaluation time.

#### 1.05 Quality Assurance

- A. The General Contractor will conduct a pre-construction meeting with all parties and trades involved in the treatment of work at and around expansion joints including, but not limited to, concrete, mechanical, electrical, HVAC, landscaping, masonry, curtain wall, waterproofing, fire-stopping, caulking, flooring and other finish trade subcontractors. All superintendents and foremen with responsibility for oversight and setting of the joint gap must attend this meeting. The General Contractor is responsible to coordinate and schedule all trades and ensure that all subcontractors understand their responsibilities in relation to expansion joints and that their work cannot impede anticipated structural movement at the expansion joints, or compromise the achievement of watertightness or life safety at expansion joints in any way.
- B. Warranty – Manufacturer's standard warranty shall apply.
- C. LEED Building Performance Requirements:
  - 1) The VOC of the silicone must not exceed 40 grams/liter
  - 2) All substitute products must be proved to be certified by independent test report to exceed the requirements of curtain wall performance tests ASTM E330, E283-04, and E331. Product must meet or exceed hurricane-force wind loading with no deflection at both positive and negative pressures up to 4954 Pascals—equal to 200 mph winds (ASTM E330-02-procedure A).
  - 3) Products must be proved to have been certified by independent test report in accordance with ASTM C518-04 and demonstrate an R-Value per 1-inch (25mm) of depth of not less than 2.15 at as-installed nominal joint size compression.
  - 4) Products must be proved to have been certified by independent test report to ASTM E-90-09 and to meet or exceed a STC rating of 52 and OITC rating of 38.
  - 5) Product must be proved by independent test report to have air permeability not to exceed 0.02 L/(s.m<sup>2</sup>) at 75 Pascals as required by the Air Barrier Association of America (ABAA) and conform to ASTM E283-04.

## PART 2 – PRODUCT

### 2.01 General

- A. Provide watertight, energy-efficient exterior joints in vertical-plane walls (above-grade). Typical locations include, but are not limited to the following: applications in window perimeters, other façade penetrations such as doors, store fronts, vents, HVAC units, panel to panel joints, curtain walls, control joints, between dissimilar materials, high-movement and seismic structural expansion joints, acoustic partition barriers, and new-to-existing connections.
- B. Provide SEISMIC COLORSEAL as manufactured by EMSEAL JOINT SYSTEMS LTD and as indicated on drawings for vertical expansion joint locations.
- C. Preformed sealant shall be silicone pre-coated, preformed, pre-compressed, self-expanding, sealant system. Expanding foam to be cellular foam impregnated with a water-based, non-drying, 100% acrylic dispersion. Seal shall combine factory-applied, low-modulus silicone and a backing of acrylic-impregnated expanding foam into a unified hybrid sealant system.
- D. Material shall be capable of movements of +50%, -50% (100% total) of nominal material size
- E. Silicone external color facing to be factory-applied to the foam while it is partially pre-compressed to a width greater than maximum joint extension and cured before final compression. When compressed to final supplied dimension, a bellow(s) to handle movement must be created in the silicone coating. Silicone coating to be available in a range of not less than 26 standard colors for coordination with typical building materials.
- F. Select the sealant system model appropriate to the movement and design requirements at each joint location that meet the project specification or as defined by the structural engineer of record.
- G. Manufacturer's Checklist must be completed by expansion joint subcontractor and returned to manufacturer at time of ordering material.

### 2.02 Fabrication

- A. SEISMIC COLORSEAL by EMSEAL JOINT SYTEMS LTD must be supplied precompressed to less than the joint size, packaged in shrink-wrapped lengths (sticks) with a mounting adhesive on one face.
- B. Directional changes and terminations into horizontal plane surfaces to be provided by factory-manufactured universal-90-degree single units containing minimum 12-inch long leg and 6-inch long leg or custom leg on each side of the direction change or through field fabrication in strict accordance with installation instructions.

## PART 3 – EXECUTION

### 3.01 Installation

A. Preparation of the Work Area

1. The contractor shall provide a properly formed and prepared expansion joint openings constructed to the exact dimensions and elevations shown on manufacturer's standard system drawings or as shown on the contract drawings. Deviations from these dimensions will not be allowed without the written consent of the engineer of record.
2. The contractor shall clean the joint opening of all contaminants immediately prior to installation of expansion joint system. Repair spalled, irregular or unsound joint surfaces using accepted industry practices for repair of the substrates in question. Remove protruding roughness to ensure joint sides are smooth. Ensure that there is sufficient depth to receive the full depth of the size of the SEISMIC COLORSEAL being installed plus at least ¼-inch (6mm) for the application of corner beads. Refer to Manufacturers Installation Guide for detailed step-by-step instructions.
3. No drilling, or screwing, or fasteners of any type are permitted to anchor the sealant system into the substrate.

3.02 Clean and Protect

- A. Protect the system and its components during construction. Subsequent damage to the expansion joint system will be repaired at the general contractor's expense. After work is complete, clean exposed surfaces with a suitable cleaner that will not harm or attack the finish.

END OF SECTION 079000

## SECTION 079200 – JOINT SEALERS

### PART 1 - GENERAL

#### 1.01 SUMMARY

##### A. Section Includes:

1. The sealing of joints indicated on schedule at the end of this section.
2. The sealing of exterior joints, including:
  - a. Coping joints
  - b. Joints around perimeter of frames
3. The sealing of interior joints, including:
  - a. Wall joints
  - b. Joints around perimeter of frames
  - c. Joints between countertops and walls
4. The sealing of concealed joints in sound-retardant assemblies, including:
  - a. Around all electric outlet boxes, between top and bottom stud runners and structure, and where indicated
5. The sealing of joints in floors and pedestrian paving
6. The sealing of penetrations through exterior walls and roofs by pipes, ducts and conduit
7. The sealing of other joints indicated on drawings

B. Joints of a nature similar to that of joints indicated on the schedule shall be sealed with same sealer, whether indicated on drawings to be sealed or not.

##### C. Related Sections:

1. Firestopping/smokestopping sealers: Elsewhere in Division 7
2. Joint sealers in roofing work: Elsewhere in Division 7

#### 1.02 REFERENCES

- A. AAMA 800-92 -- Voluntary Specifications and Test Methods for Sealants; American Architectural Manufacturers Association; 1992.
- B. ASTM C 719-93 -- Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle); 1993.
- C. ASTM C 834-95 -- Standard Specification for Latex Sealants; 1995.
- D. ASTM C 919-84(88) -- Standard Practice for Use of Sealants in Acoustical Applications; 1984 (Reapproved 1988).

- E. ASTM C 920-95 -- Standard Specification for Elastomeric Joint Sealants; 1995.
- F. ASTM C 1193-91 -- Standard Guide for Use of Joint Sealants; 1991.
- G. ASTM D 2628-91 -- Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements; 1991.
- H. FS A-A-272 -- Caulking Compounds; 1980.

### 1.03 SUBMITTALS

- A. Product Data: Manufacturer's data on each joint sealer, with instructions for substrate preparation and installation.
- B. Samples for Color Selection: Cured samples of actual products showing manufacturer's full range of colors (Products exposed to view only.)
- C. Samples for Color Verification: Cured samples of each color of each product used, prepared to simulate actual joints minimum 6 inches long; use substrates similar appearance to actual substrates. (Products exposed to view only.)
- D. Substrate Test Report for Each Sealer.
- E. Certified Product Test Reports: Independent testing agency reports showing compliance with all specified requirements.
  - 1. Reports may be on tests conducted up to 24 months before submission, provided the products tested were aged specimens of the same formulation as that to be used.
- F. Field Installation Test Reports.
- G. Certificates: For each sealer, provide manufacturer's certificate stating that the product complies with the specifications and is appropriate for the use it is being put to.
- H. Installer's Preconstruction Inspection Report: List all conditions detrimental to performance of joint sealer work.

### 1.04 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. Execution of at least 50 sealer installations of similar size and scope.
  - 2. Similar installations completed within 5 years before start of this project.
  - 3. Lead mechanic assigned from among those experienced on previous similar projects.
- B. Substrate Tests: Have samples of actual substrate materials tested by manufacturer(s) of sealer products.
  - 1. Test to determine what preparation procedures (if any are necessary to make sealers adhere properly under environmental conditions that may occur during installation.

2. Test to determine compatibility with substrates backers, and secondary seals, if any.
  3. Use manufacturer's standard test methods.
  4. Report the sealer manufacturer's recommendations for substrate preparation and sealer installation and identify specific primer(s) required.
  5. The requirement for testing for this project will be waived if test reports based on previous testing of the products and substrates to be used are acceptable to the architect.
- C. Field Installation Tests: Before installation, test the adhesion of all sealers to actual substrates.
1. Seal at least 5-foot lengths of joints and cure properly. Try to pull sealer out of joint by hand, by method recommended by sealer manufacturer.
  2. Select test joints representative of joints to be sealed by the product to be tested.
  3. Perform tests for each type of sealer.
  4. Do tests in the presence of the architect.
  5. Report acceptable results only.
- D. Mock-ups: Before beginning installation, install sealers in joints in actual construction as directed by the architect, to show color, materials, and installation. Keep mock-ups intact as the standard for evaluating the completed work.
- E. Preinstallation Meeting: Have the installer, sealer manufacturers' representatives, and other affected installers meet to review sealer installation and protection procedures and sequencing with other work.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original containers or bundles with labels showing manufacturer, product name or designation, color, shelf life, and installation instructions.

#### 1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install sealers if any of the following conditions exist:
1. Air or substrate temperatures exceed the range recommended by sealer manufacturer or is below 40 degrees F (4.4 degrees C).
  2. Substrate is wet, damp, or covered with snow, ice, or frost.
- B. Dimensional Limitations: Do not install sealers if joint dimensions are less than or greater than that recommended by sealer manufacturer; notify the architect and get sealer manufacturer's recommendations for alternative procedures.
- C. Coordination Data: Compression gasket manufacturer's requirements for joint dimensional tolerances; provide to installers of joints to be sealed with compression gaskets.

## 1.07 WARRANTY

- A. Submit written warranty signed by contractor and installer guaranteeing to correct failures in sealer work that occur within 5 years after substantial completion, without reducing or otherwise limiting any other rights to correction which the owner may have under the contract documents. Failure is defined as failure to remain weathertight due to faulty materials or workmanship. Correction is limited to replacement of sealers.

## PART 2 - PRODUCTS

### 2.01 MATERIALS - GENERAL

- A. General: Provide only products which are recommended and approved by their manufacturer for the specific use to which they are put and which comply with all requirements of the contract documents.
  - 1. For each generic product, use only materials from one manufacturer.
  - 2. Provide only materials, which are compatible with each other and with joint substrates.
  - 3. Colors of exposed sealers: As selected by the architect from manufacturer's standard colors.
- B. Manufacturers: Products of the manufacturers listed, provided they comply with requirements of the contract documents will be among those considered acceptable.
  - 1. Polysulfide sealants:
    - a. A. C. Horn, Inc.
    - b. W. R. Meadows, Inc.
    - c. Pecora Corporation
    - d. Products Research & Chemical Corporation
  - 2. Silicone sealants:
    - a. Bostik Inc.
    - b. Dow Corning Corporation
    - c. Pecora Corporation
    - d. Tremco, Inc.
    - e. GE Silicones
    - f. Rhone-Poulenc, Inc.
  - 3. Urethane sealants:
    - a. Bostik Inc.
    - b. Mameco International, Inc.
    - c. Pecora Corporation.
    - d. Products Research & Chemical Corporation.
    - e. Sika Corporation.
    - f. Sonneborn Building Products Division/ChemRex, Inc.
    - g. Tremco, Inc.
    - h. W. R. Meadows, Inc.

4. Acrylic solvent-release sealants:
  - a. Pecora Corporation
  - b. Koch Protective Treatments, Inc.
  - c. Tremco, Inc.
5. Butyl sealants:
  - a. Pecora Corporation
  - b. Koch Protective Treatments, Inc.
  - c. Tremco, Inc.
6. Acrylic-latex emulsion sealant:
  - a. Bostik Inc.
  - b. Pecora Corporation
  - c. Sonneborn Building Products Division/ChemRex, Inc.

## 2.02 ELASTOMERIC SEALANTS

- A. Elastomeric Sealants - General: Chemically curing elastomeric sealants of types indicated, complying with ASTM C 920, including specific Type, Grade, Class, and Uses indicated, as well as all other requirements specified.
  1. Where movement capability exceeding that measured by ASTM C 920 is specified, sealant shall withstand the total movement indicated while remaining in compliance with the other requirements specified, when tested in accordance with ASTM C 719, with base joint width measured at the time of application.
  2. For M-type substrates: Comply with requirements for Use M.
  3. For G-type substrates: Comply with requirements for Use G.
  4. For A-type substrates: Comply with requirements for Use A.
  5. For O-type substrates: Comply with requirements Use M (minimum) and Use O for the particular substrate.
- B. Two-Part Pourable Polysulfide Sealant: Type M, Grade P, Class 12-1/2, Use T.
- C. Polysulfide Sealant for Water Immersion: Type M, Grade NS, Class 12-1/2, Use T, specifically recommended by the manufacturer for sealing joints immersed continuously in water.
- D. One-Part Non-sag Polysulfide Sealant: Type S, Grade NS, Class 12-1/2, Use NT.
- E. High Movement Silicone Sealant: One- or two-part non-acid-curing, Grade NS, Class 25, Use NT, plus movement capability of at least 50 percent in both extension and compression.
- F. Medium Movement Silicone Sealant: One- or two-part non-acid-curing, Grade NS, Class 25, Use NT, plus movement capability of more than 25 percent but less than 50 percent in both extension and compression.
- G. High Strength Silicone Sealant: One-part, acid- or non-acid-curing, Type S, Grade NS, Class 25, Use NT; with not over plus or minus 30 percent movement capability.

- H. Mildew-Resistant Silicone Sealant: One-part, Type S, Grade NS, Class 25, Use NT, formulated with fungicide, for interior use on nonporous substrates.
- I. Silicone Sealant for Use T: One-part, non-acid curing, Type S, Grade NS, Class 25, Use T, Use M, plus movement capability of 50 percent in both extension and compression.
- J. All-Purpose Urethane Sealant: Multipart, non-sag, Type M, Grade NS, Class 25, Uses NT, M, G and A.
- K. Multipart Pourable Urethane Sealant: Type M, Grade P, Class 25, Use T.
- L. Non-sag Urethane Sealant for Use T: Type S or M, Grade NS, Class 25, Use T.
- M. One-Part Pourable Urethane Sealant: Type S, Grade P, Class 25, Use T.
- N. Urethane Sealant for Water Immersion: One- or two-part urethane, Grade NS, Class 25, Use NT, specifically recommended by the manufacturer for sealing joints immersed continuously in water.

### 2.03 SOLVENT-RELEASE-CURING SEALANTS

- A. Acrylic Sealant: Non-sag, one-part, solvent-release-curing; complying with ASTM C 920, Type S Grade NS, Use NT, with the following exceptions:
  - 1. Weight loss: 15 percent, maximum.
  - 2. Movement capability: 12-1/2 percent in both extension and compression, minimum.
- B. Butyl Sealant: Non-sag, one part, solvent-release-curing; complying with FS A-A-272, Type III; non-staining; paintable.

### 2.04 LATEX SEALANTS

- A. Acrylic-Latex Emulsion Sealant: One-part, non-sag, mildew-resistant, paintable; complying with ASTM C 834.

### 2.05 NON-CURING SEALERS

- A. Non-curing Butyl Sealant: Nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic rubber sealant.
- B. Butyl Polyisobutylene Sealant: Non-curing, nondrying, solvent-release; complying with 809.2, as described in AAMA 800.

### 2.06 COMPRESSION SEALS

- A. Compression Gaskets: Neoprene (polychloroprene) hollow gasket; complying with ASTM D 2628; sizes and shapes as indicated.
  - 1. Accordion Type
  - 2. Manufacturers:
    - a. The D. S. Brown Company.

b. Watson Bowman Acme Corp.

## 2.07 SEALANT BACKERS

- A. Backers - General: Non-staining; recommended or approved by sealant manufacturer for specific use.
- B. Backer Rods: Flexible, nonabsorbent, compressible polyurethane foam, either open-cell or non-gassing closed-cell, unless otherwise restricted by sealant manufacturer; preformed to appropriate size and shape.

## 2.08 MISCELLANEOUS MATERIALS

- A. Primers: Use primers determined to be required by substrate tests.
- B. Cleaners: As recommended by sealer manufacturer and not damaging to substrates.
- C. Masking Tape: Nonabsorbent, non-staining.
- D. Tooling Agents: Approved by sealant manufacturer; non-staining to sealant and substrate.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine joints for characteristics that may affect sealer performance, including configuration and dimensions.
- B. For compression gaskets, joints should have straight, parallel sides within proper tolerances, free of spalls.
- C. Do not begin joint sealer work until unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

- A. Cleaning: Just before starting sealer installation, clean out joints in accord with recommendations of sealer manufacturers and as follows:
  - 1. Remove all material that could impair adhesion, including dust, dirt, coatings, paint, oil, and grease. Exception: Materials tested to show acceptable adhesion and compatibility.
  - 2. Dry out damp and wet substrates thoroughly.
  - 3. Clean M-type and O-type substrates by suitable mechanical or chemical methods.
  - 4. Remove loose particles by vacuuming or by blowing with oil-free compressed air.
  - 5. Concrete: Remove laitance and form-release coatings.

- 6. Clean A-type and G-type substrates by chemical or other methods, which will not damage the substrate.
- 7. Use methods, which will not leave residues that will impair adhesion.
- B. Priming: Prime substrates as recommended by sealer manufacturer.
- C. Masking Tape: Use masking tape to keep primers and sealers off of adjacent surfaces, which would be damaged by contact or by cleanup. Remove tape as soon as practical.
- D. Install fillers where needed to provide proper joint depth or support for sealant backers.

### 3.03 INSTALLATION

- A. Comply with sealer manufacturers' instructions and recommendations, except where more restrictive requirements are specified.
- B. Gunnable and Pourable Sealants: Comply with recommendations of ASTM C 1193.
- C. Sealants in Acoustical Assemblies: Comply with recommendations of ASTM C 919.
- D. Backers:
  - 1. Install backers at depth required to result in shape and depth of installed sealant, which allows the most joint movement without failure.
    - a. Make backers continuous, without gaps, tears, or punctures.
    - b. Do not stretch or twist backers.
  - 2. If backers become wet or damp before installation of sealant, dry out thoroughly before proceeding.
- E. Sealants: Use methods recommended by manufacturer completely fill the joint; make full contact with bond surfaces; tool non-sag sealants to smooth surface eliminating air pockets.
  - 1. Use concave joint shape shown in Figure 5A in ASTM C 1193, where not otherwise indicated.
- F. Compression Gaskets: Use methods recommended by manufacturer; use as few end joints as possible; apply adhesive just before installing gaskets; make adhesively sealed joints at ends, corners, and intersections; install with top face approximately 1/8 to 1/4 inch below adjoining surfaces.

### 3.04 PROTECTION AND CLEANING

- A. Clean surfaces adjacent to joints as work progresses and before sealants set using methods and materials approved by manufacturers of sealers and of surfaces to be cleaned.
- B. Protect joint sealers from contamination and damage.
- C. Remove and replace damaged sealers.

### 3.05 SCHEDULE OF JOINT SEALERS

- A. General: Unless otherwise indicated, joints around perimeter of frames, where indicated to be sealed, are to be sealed using sealer specified for the substrate adjacent to the frame.
- B. Exterior Joints for Which No Other Sealer Is Indicated:
  - 1. Use one of the following sealants:
    - a. High movement silicone sealant
    - b. Medium movement silicone sealant
  - 2. Backer: Backer rod
  - 3. Joint shape: Concave joint configuration
- C. Interior Joints for Which No Other Sealer Is Indicated:
  - 1. Use one of the following sealants:
    - a. Acrylic-emulsion latex sealant
  - 2. Backer: Backer rod
  - 3. Joint shape: Concave joint configuration
- D. Below-Grade Joints:
  - 1. Use one of the following sealants:
    - a. Polysulfide sealant for water immersion
    - b. Urethane sealant for water immersion
  - 2. Backer: Backer rod
  - 3. Joint shape: Concave joint configuration
- E. Exterior Joints Well Protected from Weather and Not Subject to Movement:
  - 1. Use one of the following sealants:
    - a. Acrylic sealant
    - b. Butyl sealant
  - 2. Backer: Backer rod
- F. Interior Floor Joints and Pedestrian Paving Joints, Less than 1-1/2 Percent Slope:
  - 1. Use one of the following sealants:
    - a. Compression gasket
    - b. Two-part pourable polysulfide sealant
    - c. Silicone sealant for Use T
    - d. Two-part pourable urethane sealant
    - e. Two-part nonsag urethane sealant for Use T
    - f. One-part pourable urethane sealant
  - 2. Backer: Backer rod

3. Joint shape: Concave joint configuration
- G. Joints around Pipes, Ducts, and Conduit Penetrating Exterior Walls and Roofs:
1. Use one of the following sealants:
    - a. Same as used for adjacent substrates
- H. Joints in Interior Wet Areas:
1. Use one of the following sealants:
    - a. Mildew-resistant silicone sealant
  2. Backer: Backer rod
  3. Joint shape: Concave joint configuration
- I. Concealed Joints in Acoustical Assemblies:
1. Use one of the following sealants:
    - a. Acrylic-emulsion latex sealant
    - b. Non-curing butyl sealant
    - c. Butyl polyisobutylene sealant

END OF SECTION 079200

## SECTION 079513 – EXPANSION JOINT COVER ASSEMBLIES

### PART 1 - GENERAL

#### 1.1 GENERAL REQUIREMENTS

- A. Conform to sections of Division 1 as applicable.

#### 1.2 RELATED WORK

- A. Section 033000 – Cast – in – place concrete
- B. Section 079000 – Pre-Compressed Expansion Joints
- C. Section 079200 – Joint Sealants

#### 1.3 SUBMITTALS

- A. Submit manufacturer's product technical data showing relevant performance criteria.
- B. Submit manufacturer's installation instructions.
- C. Submit shop drawings showing profile dimensions, splicing details, joinery details with other systems, special end conditions, fasteners, adhesives and relationships to adjoining work prior to shipment of materials to the site.
- D. Samples of profiles, colors and materials for each joint cover assembly for approval before used on site.
- E. Submit manufacturer's warranty letters as per general requirements of the contract.

#### 1.4 QUALITY ASSURANCE

- A. Obtain expansion joint cover assemblies from one source (from a single manufacturer) whenever possible to avoid any compatibility issues.
- B. In addition to requirements of project specifications, comply with manufacturer's instructions and recommendations for all phases of work, including preparation of substrate, applying materials, and protection of installed units.
- C. Obtain a letter from the manufacturer certifying that product selection, preparation and placement of the expansion joint system is in accordance with manufacturer's requirements.
- D. Defects or deficiencies include adhesive and cohesive failures, system's inability to accommodate specified movements, moisture penetration in case of watertight applications, inability to withstand loading and traffic requirements, cracking of nosing/filler materials due to aggregate loading, not conforming to specified geometries, and improper workmanship.

- E. Defects and deficiencies are to be corrected by the expansion joint installer at no cost to the owner during the period of manufacturer's warranty.
- F. Products shall be installed either by manufacturers licensed applicators, approved installers or after installation training from the manufacturer.
- G. Materials and work should conform to all applicable codes and requirements of local authorities having jurisdiction.
- H. Where indicated, install fire barriers, before the installation of expansion joints.
- I. Install fire assemblies if required from one source (from a single manufacturer) and not necessarily from the expansion joint manufacturer to avoid compatibility issues in areas requiring fire barriers only and no expansion joint assemblies.

#### 1.5 ENVIRONMENTAL CONDITIONS

- A. Do not install products at temperatures less or more than published in manufacturer's product data.
- B. Do not install products without prior approval in damp or wet substrates.
- C. Do not install products without prior approval that might come in contact with aggressive media during the construction process.

#### 1.6 REFERENCES

- A. Reserved.
- B. ASTM – D2240 – 97, Durometer hardness in rubbers.
- C. Reserved
- D. Reserved
- E. ASTM – D3574, Flexible Cellular Materials - Slab, Bonded, and Molded Urethane Foams - Compression Force Deflection
- F. Reserved

#### 1.7 DELIVERY, STORAGE AND HANDLING

- A. Exercise proper care in handling of all work so as not to harm the finished surface and take proper precautions to protect the work from damage after it is in place.
- B. Store materials under cover in a dry and clean location off the ground.
- C. Store adhesives, epoxies and resins at room temperature.
- D. Remove materials that are damaged or otherwise not suitable for installation and replace with acceptable materials before handing over the completed work to the site authorities.
- E. Installed assemblies should be identical to submitted and reviewed shop drawings, samples and certificates.

## PART 2 - MATERIALS AND PRODUCTS

### 2.1 MATERIALS

- A. Aluminum and steel alloys and extrusions should be treated and finished to suit project requirements.
- B. Rubber inserts should be ADA compliant and capable of withstanding design temperatures, design loads and design movements. Rubber inserts should be heat weldable when necessary to create watertight transitions.
- C. Nosing materials should conform to required elastomeric properties maintaining 1:2 resins to aggregate ratio.
- D. Preformed sealants and rubber products required to accommodate movements and maintain memory should not experience compression set beyond desirable limits as mentioned in ASTM standards given in 1.6 - section references.
- E. Profile design and shape should be ADA compliant and capable of withstanding design loads and provide structural separation and movement without disturbing the integrity of adjacent substrates.
- F. Fasteners or adhesive materials should not contaminate the substrate, create undue stresses at joint edges or compromise the functionality of adjacent materials and substrates.
- G. Reserved

### 2.2 FABRICATION

- A. Fabricate expansion joint covers, square, true, straight and accurate to required joint sizes and profile dimensions.
- B. Fabricate lengths in continuous runs of at least 2.00LM for precompressed sealants, at least 3.00LM for metal parts and at least 20.00LM for rubber parts.
- C. Assemble systems in shops wherever practicable.
- D. Make available to the installer all necessary tools, mixing equipment and welding equipment to ensure proper installation.
- E. Fabricate and supply all necessary accessories to suit the application and to deliver required performance.
- F. Provide isolation coatings, rust inhibitive paints or dielectric separators where aluminum components will be in contact with concrete, masonry or dissimilar materials.
- G. Fabricate and make available all profiles for flat and corner installations.
- H. Reserved

## 2.3 PRODUCTS

A. Expansion joint assemblies installed in interior spaces should be able to accommodate a total movement of 33% of the specified joint width. Assemblies should be able to accommodate movement sin three directions under specified loading.

B. Interior floors with retrofit conditions or surface mounted assemblies:

Basis of Design: EMSEAL Migua FN series.

Expansion joint assemblies to bridge XXmm wide joint gaps comprising of metallic anchorage units (rails) installed on both sides of the gap and a flexible rubber insert bridging the gap. The anchorage units are fastened on top of the finished floor. Profile should be capable of withstanding loads from occasional vehicular traffic.

## PART 3 - EXECUTION

### A. SURFACE CONDITION

1. Joint surfaces to receive seal shall be sound, smooth, straight, parallel, clean, dry and free of all visible contaminants. Applications of non-visible coatings or contaminants to surfaces of joint interface area prior to installation of seal shall be controlled by the Architect/Engineer in consultation with the expansion joint manufacturer.

### B. INSTALLATION

1. The following is a general summary of installation requirements. In all cases the manufacturer's standard written instructions or specific instructions of a manufacturer's technician are to be followed.
2. Set work plumb, square, level and free from distortion.
3. Use anchoring devices and fasteners for securing expansion joint cover assemblies to in-place construction. Provide chemical fasteners wherever possible and as recommended or supplied by expansion joint manufacturer.
4. System to be leveled into and embedded in 2-part hi-mod epoxy-gel setting-bed as supplied by expansion joint manufacturer in blockout mounted horizontal applications. Ensure that no rattling or movement occurs between the substrate and the profile.
5. System to be leveled into and fastened to the studs behind the wall finishes in blockout mounted vertical applications.
6. Perform all cutting, assembling and fitting required for installation of expansion joint covers.
7. If being installed in blockouts on each side of the joint-gap, the blockout depth shall equal the system leg height plus ¼-inch (6mm). The blockout width on each side of the joint-gap will vary with model being installed and with size of joint-gap (consult with manufacturer before casting or cutting blockouts).

8. Install joint cover assemblies in true alignment and proper relationship to expansion joints and adjoining finished surfaces measured from established lines and levels. Securely attach in place with all required accessories. Locate anchors at recommended intervals, and not less than 3 inches from each end.
9. Maintain continuity of expansion joint cover assemblies with end joints held to a minimum. Lengths of profiles with one-piece anchorage unit are connected with the help of slide-in connecting pins. Lengths of profiles with two-piece anchorage units are connected by staggering the aluminum profiles.
10. The blockouts in case of recessed profiles are to be filled flush to the floor or top surface of the expansion joint with a low-modulus elastomeric concrete capable of handling expected loads. If installing into floor where special floor covering is specified, joint system must be installed higher than the sub-floor level by an amount which will allow the flooring material to be installed flush to the finished surface of the joint system.
11. Reserved

### 3.2 CLEANING AND PROTECTION

- A. Do not remove protective materials until finish work in adjacent areas is complete.
- B. When protective material is removed, clean exposed metal surfaces to comply with manufacturer's instructions.
- C. Remove all waste materials from the site.
- D. Seal shall be cleaned of all foreign matter as recommended by the seal manufacturer.
- E. Leave work in a condition satisfactory to the Architect/Engineer.

END OF SECTION 079513



## SECTION 081113 – HOLLOW METAL DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

##### A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

##### B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section "Flush Wood Doors".
3. Division 08 Section "Glass and Glazing" for glass view panels in hollow metal doors.
4. Division 08 Section "Door Hardware".
5. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
6. Division 26 "Electrical" Sections for electrical connections including conduit and wiring for door controls and operators installed on frames with factory installed electrical knock out boxes.

##### C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.

11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- C. Shop Drawings: Include the following:
  1. Elevations of each door design.
  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 anchorages, joints, field splices, and connections.
  6. Details of accessories.
  7. Details of moldings, removable stops, and glazing.
  8. Details of conduit and preparations for power, signal, and control systems.
- D. Samples for Verification:
  1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40" above sill) or UL 10C.
  1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.

2. Temperature-Rise Limit: Where indicated 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.
  3. Smoke Control Door Assemblies: Comply with NFPA 105.
    - a. 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.
- D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are 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. Provide labeled glazing material.
- E. Energy Efficient Exterior Openings: Comply with minimum thermal ratings, based on ASTM C1363. Openings to be fabricated and tested as fully operable, thermal insulating door and frame assemblies.
1. Thermal Performance (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with ASTM C1363 and meet or exceed the following requirements:
    - a. Door Assembly Operable U-Factor and R-Value Ratings: U-Factor 0.29, R-Value 3.4, including insulated door, thermal-break frame and threshold.
  2. Air Infiltration (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with ASTM E283 to meet or exceed the following requirements:
    - a. Rate of leakage of the door assembly shall not exceed 0.25 cfm per square foot of static differential air pressure of 1.567 psf (equivalent to 25 mph wind velocity).
- F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
  1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

## 1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

## 1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:
  - 1. CECO Door Products (C).
  - 2. Curries Company (CU).
  - 3. Pioneer Industries (PI).

### 2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

### 2.3 HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.
- B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, and ANSI/SDI A250.4 for physical performance level.

1. Design: Flush panel.
2. Core Construction: Foamed in place polyurethane and steel reinforced core with no stiffener face welds.
  - a. Provide 18 gauge steel vertical reinforcements 6 inches apart and welded in place. Foamed in place polyurethane core is chemically bonded to all interior surfaces. No face welding is permitted.
  - b. Thermal properties to rate at a fully operable minimum U-Factor 0.374 and R-Value 2.53, including insulated door, Mercury thermal-break frame and threshold.
  - c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.378 and R-Value 2.5, including insulated door, kerf type frame, and threshold.
3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
  - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

## 2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102,

and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16" positive thermal break and integral vinyl weatherstripping.

- C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
  - 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
  - 2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
- D. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
  - 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
  - 2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
- E. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
- F. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

## 2.5 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, 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 and not less than 0.042 inch thick.
  - 3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

## 2.6 LOUVERS

- A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.
  - 1. Blade Type: Vision proof inverted V or inverted Y.
  - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.
- B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.
  - 1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.

2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

## 2.7 LIGHT OPENINGS AND GLAZING

- A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
- B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
- C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
- D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

## 2.8 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 inches thick.

## 2.9 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 thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
  1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
  2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
  3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" 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.
  4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: 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.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
  - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
3. 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.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Electrical Knock Out Boxes: Factory weld 18 gauge electrical knock out boxes to frame for electrical hardware preps; including but not limited to, electric through wire transfer hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".
  - a. Provide electrical knock out boxes with a dual 1/2-inch and 3/4-inch knockouts.
  - b. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.
  - c. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section "Door Hardware".
  - d. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.
9. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
10. Jamb Anchors: Provide number and spacing of anchors as follows:
  - a. Masonry 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) 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 1 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 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
  - 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
11. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
  12. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.
- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
  2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
  3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
  4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

## 2.10 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

## PART 3 - EXECUTION

### 3.1 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. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 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. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

### 3.3 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 and NFPA 80 at fire rated openings.
  - 1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
  - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
  - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
  - 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
  - 1. Non-Fire-Rated Standard Steel Doors:
    - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
  - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glass and Glazing" and with hollow metal manufacturer's written instructions.

### 3.4 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 and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 081113



## SECTION 081416 – FLUSH WOOD DOORS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

1. Solid core doors with wood veneer faces.
2. Factory finishing wood doors.
3. Factory fitting 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.
6. Factory installed glazing in wood doors.

- B. Related Sections:

1. Division 08 Section "Hollow Metal Doors and Frames".
2. Division 08 Section "Glass and Glazing".
3. Division 08 Section "Door Hardware".
4. Division 08 Section "Glass-Fire Resistant Glazing".
5. Division 08 Section "Fire Rated Glass".

- C. Standards and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ANSI A208.1 – Wood Particleboard.
3. Forestry Stewardship Council (FSC) - Guidelines for environmentally certified wood doors.
4. Intertek Testing Service (ITS Warnock Hersey) - Certification Listings for Fire Doors.
5. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.

6. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
7. UL 10C - Positive Pressure Fire Tests of Door Assemblies; UL 1784 - Standard for Air Leakage Tests of Door Assemblies.
8. Window and Door Manufacturers Association - WDMA I.S.1-A Architectural Wood Flush Doors.

### 1.3 SUBMITTALS

Product Data: For each type of door indicated. Include details of core and edge construction, louvers, trim for openings, and WDMA I.S.1-A classifications. Include factory finishing specifications.

A. Shop Drawings shall include:

1. Indicate location, size, and hand of each door.
2. Indicate dimensions and locations of mortises and holes for hardware.
3. Indicate dimensions and locations of cutouts.
4. Indicate requirements for veneer matching.
5. Indicate location and extent of hardware blocking.
6. Indicate construction details not covered in Product Data.
7. Indicate doors to be factory finished and finish requirements.
8. Indicate fire protection ratings for fire rated doors.

B. Samples for Initial Selection: For factory finished doors.

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
2. Corner sections of doors, 8 by 10 inches, with door faces and edges representing actual materials to be used.
  - a. Provide samples for each species of veneer and core material.
  - b. Finish veneer faced door samples with same materials proposed for factory finished doors.
3. Frames for light openings, 6 inches long, for each material, type, and finish required.

C. Warranty: Provide sample of manufacturer's warranty.

### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer wherever possible.

- B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors'.
- 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 UL10C.
  - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies provide manufacturer's construction label, indicating compliance to independent 3<sup>rd</sup> party certification agency's procedure, except for size.
  - 2. 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.
  - 3. 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.
- D. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for receiving, handling, and installing flush wood doors.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package pre-finished doors individually in plastic bags and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top rail with opening number used on Shop Drawings.

#### 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

#### 1.7 WARRANTY

- A. Warranty: Manufacturer's standard form in which 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 wood face veneers exceeding 0.01 inch in a 3-inch span.
  - 2. Warranty includes 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.

## PART 2 - PRODUCTS

### 2.1 DOOR CONSTRUCTION – GENERAL

- A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty; Aesthetic Grade: Premium.
- B. Fire Rated Doors: Provide construction and core as needed to provide fire ratings indicated.
  1. Category A Edge Construction: Provide fire rated door edge construction with intumescent seals concealed by outer stile (Category A) at 45, 60, and 90 minute rated doors. Comply with specified requirements for exposed edges.
  2. Pairs: Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
    - a. Provide fire retardant stiles that are listed and labeled for applications indicated without formed steel edges and astragals.
    - b. Where required for concealed hardware, provide formed steel edges and astragals with intumescent seals. Finish steel edges and astragals with baked enamel.

### 2.2 CORE CONSTRUCTION

- A. Structural Composite Lumber Core Doors:
  1. Structural Composite Lumber: Engineered hardwood composite wood products tested in accordance with WDMA I.S.1A, Testing Cellulosic Composite Materials for Use in Fenestration Products containing no added Urea Formaldehyde.
- B. Particleboard Core Doors:
  1. Particleboard: Wood fiber based materials complying with ANSI A208.1 Particleboard standard. Grade LD-2.
  2. Adhesive: Fully bonded construction using Polyurethane (PUR) glue.
  3. Blocking: As indicated under article "Blocking".
- C. Fire Resistant Composite Core Doors:
  1. Core: Non-combustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire protection rating indicated.
  2. Blocking: As indicated under article "Blocking".
  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.

## 2.3 BLOCKING

### A. Fire Rated Doors:

1. Provide blocking as indicated below:
  - a. HB1: 5 inch in doors indicated to have closers and overhead stops.
  - b. HB4: Two 5 inch x 14 inch lock blocking in doors indicated to have exit devices.
  - c. HB8: Two 5 inch x 14 inch corner blocking and two 5 inch x 14 inch lock blocking on doors to have vertical rod exit devices.

## 2.4 VENEERED DOORS FOR TRANSPARENT FINISH

### A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ASSA ABLOY Wood Doors (GR): GPD Series.
2. Eggers Industries (EG): Premium Series.
3. Marshfield-Algoma (MF): Signature Series.

### B. Interior Solid Core Doors:

1. Grade: Premium.
2. Faces: Veneer grades as noted below; veneer minimum 1/50-inch thickness at moisture content of 12% or less.
  - a. Plain Sliced Select White Oak, A grade faces (Architect to confirm).
3. Match between Veneer Leaves: Book match.
4. Assembly of Veneer Leaves on Door Faces:
  - a. Running Match.
5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
6. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.
7. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors
8. Construction: Five plies. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.
9. At doors over 40% of the face cut-out for lights and or louvers, furnish engineered composite lumber core.

## 2.5 LOUVERS

- A. Metal Louvers: Door manufacturer's standard metal louvers unless otherwise indicated.
  - 1. Blade Type: Vision proof inverted V or inverted Y.
  - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish.

## 2.6 LIGHT FRAMES AND GLAZING

- A. Wood Beads for Light Openings in Wood Doors up to and including 20-minute rating:
  - 1. Wood Species: Same species as door faces.
  - 2. Profile:
    - a. M1 Flush Bead.
    - b. At wood core doors with 20-minute fire protection ratings, provide wood beads and metal glazing clips approved for such use.
- B. Metal Frames for Light Openings in Fire Rated Doors over 20-minute Rating: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated.
  - 1. Manufacturers:
    - a. Air Louver (LV).
    - b. All Metal Stamping (AP).
    - c. Pemko (PE).
- C. Glazing: Comply with installation requirements in Division 08 Sections 088100, 088117, and 088813 and with the flush wood door manufacturer's written instructions.
  - 1. Pre-Installed Glazing: Install glazing in doors as indicated. Pre-installed glass to include all of the required glazing material.

## 2.7 FABRICATION

- A. Factory fit doors to suit frame opening sizes indicated.
  - 1. Comply with requirements in NFPA 80 for fire rated doors.
  - 2. Undercut: As required per manufacturer's templates and sill condition.
- B. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
  - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
  - 2. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire rated doors.
- C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
  2. Glazing: Comply with applicable requirements in Division 08 Section "Glazing."
  3. Louvers: Factory install louvers in prepared openings.
- D. Electrical Raceways: Provide flush wood doors receiving electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through wire transfer hardware or wiring harness specified in hardware sets in Division 08 "Door Hardware". Wire nut connections are not acceptable.

## 2.8 FACTORY FINISHING

- 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. Transparent Finish: Provide a clear protective coating over the wood veneer allowing the natural color and grain of the selected wood species to provide the appearance specified. Stain is applied to the wood surface underneath the transparent finish to add color and design flexibility.
1. Finish: Meet or exceed WDMA I.S. 1A TR8 UV Cured Acrylate Polyester finish performance requirements.
  2. Staining:
    - a. Custom stain to meet architect's requirements.
  3. Sheen: Satin.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
1. Verify that 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.

### 3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Installation Instructions: Install doors and frames to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire rated doors in corresponding fire rated frames according to NFPA 80.
- C. Factory Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory Finished Doors: Restore finish before installation if fitting or machining is required at Project site.
- E. Field modifications to doors shall not be permitted, except those specifically allowed by manufacturer or fire rating requirements.

### 3.3 ADJUSTING

- A. Operation: Re-hang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors 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 081416

## SECTION 081743 - FRP/ Aluminum Hybrid Doors

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. SL-17 Pebble Grain FRP/ Aluminum Hybrid Door.
- B. SL-17 Pebble Grain FRP/ Aluminum Hybrid Door installed in Aluminum Framing.
- C. SL-17 Pebble Grain FRP/ Aluminum Hybrid Door installed in Thermally Broken Aluminum Framing.
- D. SL-17 Pebble Grain FRP/ Aluminum Hybrid Door installed in Retrofit Aluminum Framing.

#### 1.02 RELATED SECTIONS

- A. Section 08 01 17 – Operation and Maintenance of Integrated Door Opening Assemblies.
- B. Section 08 06 71 – Door Hardware Schedule.
- C. Section 08 06 80 – Glazing Schedule.
- D. Section 08 10 00 – Doors and Frames.
- E. Section 08 12 16 – Aluminum Frames.
- F. Section 08 42 13 – Aluminum-Framed Entrances.
- G. Section 08 71 00 – Door Hardware.
- H. Section 08 91 26 – Door Louvers.

#### 1.03 REFERENCES

- A. [AAMA 1304](#) – Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.
- B. [AAMA 1503-98](#) – Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- C. [ANSI A250.4](#) – Test Procedure and Acceptance Criteria for Physical Endurance of Steel Doors and Hardware Reinforcing.
- D. [ASTM-B117](#) – Standard Practices for Operating Salt Spray (Fog) Apparatus.
- E. [ASTM-B209](#) – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- F. [ASTM-B221](#) – Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- G. [ASTM-C518](#) – Standard test Method for Steady-State Thermal Transmission Properties by Means of Heat Flow Meter Apparatus.
- H. [ASTM-D256](#) – Standard Test Methods for Determining the Pendulum Impact Resistance of Plastics.
- I. [ASTM-D570](#) – Standard Test Method for Water Absorption of Plastics.
- J. [ASTM-D638](#) – Standard Test Method for Tensile Properties of Plastics.
- K. [ASTM-D790](#) – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- L. [ASTM-D1621](#) – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
- M. [ASTM-D1622](#) – Standard Test Method for Apparent Density of Rigid Cellular Plastics.
- N. [ASTM-D1623](#) – Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
- O. [ASTM-D2126](#) – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
- P. [ASTM-D2583](#) – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
- Q. [ASTM-D3029](#) – Test Methods for Impact Resistance of Flat Rigid Plastic Specimens by Means of a Tup (Falling Weight) (Withdrawn 1995) (Replaced by ASTM-D5420).
- R. [ASTM-D5116](#) – Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/ Products.
- S. [ASTM-D5420](#) – Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).

- T. [ASTM-D6670](#) – Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/ Products.
- U. [ASTM-E84](#) – Standard Test Method for Surface Burning Characteristics of Building Materials.
- V. [ASTM-E90](#) – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
- W. [ASTM-E283](#) – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- X. [ASTM-E330](#) – Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- Y. [ASTM-E1886](#) – Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
- Z. [ASTM-E1996](#) – Standard Specification for Performance of Exterior Windows, Glazed Curtain Walls, Doors and Storm Shutters Impacted by Wind Borne Debris in Hurricanes.
- AA. [ASTM-F476](#) – Standard Test Methods for Security of Swinging Door Assemblies.
- BB. [ASTM-F1642-04](#) – Standard Test Method for Glazing Systems Subject to Air Blast Loading.
- CC. [NWWDA T.M. 7-90](#) – Cycle Slam Test Method.
- DD. [NFRC 100](#) – Procedure for Determining Fenestration Products U-Factors.
- EE. [NFRC 400](#) – Procedure for Determining Fenestration Products Air Leakage.
- FF. [TAS 201](#) – Impact Test Procedures.
- GG. [TAS 202](#) – Criteria for Testing Impact & Nonimpact Resistant Building Envelope Components Using Uniform Static Air Pressure.
- HH. [TAS 203](#) – Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.

#### 1.04 SUBMITTALS

- A. Must comply with Section 01 33 00 – Submittal Procedures.
- B. Action Submittals/ Informational Submittals.
  - 1. Product Data.
    - a. Submit manufacturer’s product data sheets, catalog pages illustrating the products, description of materials, components, fabrication, finishes, installation instructions, and applicable test reports.
  - 2. Shop Drawings.
    - a. Submit manufacturer’s shop drawings, including elevations, sections, and details indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.
  - 3. Samples.
    - a. Submit manufacturer’s door sample composed of door face sheet, core, framing and finish.
    - b. Submit manufacturer’s sample of standard colors for door face and frame.
  - 4. Testing and Evaluation Reports.
    - a. Submit testing reports and evaluations provided by manufacturer conducted by and accredited independent testing agency certifying doors and frames comply with specified performance requirements listed in Section 2.04.
  - 5. Manufacturer Reports.
    - a. Manufacturer’s Project References.
      - 1. Submit list of successfully completed projects including project name, location, name of architect, type, and quantity of doors manufactured.
- C. Closeout Submittals.
  - 1. Operation and Maintenance Manual.
    - a. Submit manufacturer’s maintenance and cleaning instructions for doors and frames, including maintenance and operating instructions for hardware.
  - 2. Warranty Documentation.
    - a. Submit manufacturer’s standard warranty.

## 1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications.
  - 1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 25 years concurrent successful experience.
  - 2. Door and frame components must be fabricated by same manufacturer.
  - 3. Evidence of a documented complaint resolution quality management system.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery.
  - 1. Deliver materials to site in manufacturer's original, unopened, containers and packaging.
  - 2. Labels clearly identifying opening, door mark, and manufacturer.
- B. Storage.
  - 1. Store materials in a clean, dry area, indoors in accordance with manufacturer's instructions.
- C. Handling.
  - 1. Protect materials and finish from damage during handling and installation.

## 1.07 WARRANTY

- A. Warrant doors, frames, and factory installed hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.
- B. Standard Period.
  - 1. Ten years starting on date of shipment.
- C. Limited lifetime
  - 1. Covers failure of corner joinery, core deterioration, and delamination or bubbling of door skin and corrosion of all-fiberglass products while the door is in its specified application in its original installation.
- D. Finish
  - 1. Kynar painted aluminum: 10 years.
  - 2. Painted SL-17, SL-18, SL-19, SL-19-1, and SL-20 face sheets: 5 years.
  - 3. Painted AF-150 frames, AF-250 frames: 3 years.
  - 4. Anodized, aluminum: 10 years.
  - 5. Thresholds do not have a finish warranty.

## PART 2 PRODUCTS

### 2.01 FRP/ALUMINUM HYBRID DOORS

- A. Manufacturer.
  - 1. Special-Lite, Inc.
    - a. PO Box 6, Decatur, Michigan 49045.
    - b. Toll Free (800) 821-6531, Phone (269) 423-7068, Fax (800) 423-7610.
    - c. Web Site [www.special-lite.com](http://www.special-lite.com).
    - d. E-Mail [info@special-lite.com](mailto:info@special-lite.com).

### 2.02 DESCRIPTION

- A. Model.
  - 1. [SL-17 Pebble Grain FRP/ Aluminum Hybrid Door](#).
- B. Door Opening Size.
  - 1. As indicated in the door schedule
- C. Construction.
  - 1. Door Thickness.
    - a. 1-3/4".
  - 2. Stiles & Rails.

- a. Aluminum extrusions made from 6063 aluminum alloys with a minimum temper of T5.
  - b. Minimum 2-5/16" deep one-piece extrusion with have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place and permit flush appearance.
  - c. Screw or snap in place applied caps are not acceptable.
  - d. Top rails must have integral legs for interlocking continuous extruded aluminum flush cap.
  - e. Bottom rails must have integral legs for interlocking continuous weather bar with single nylon brush weather stripping or manually adjustable SL-301 door bottom with two nylon brush weather stripping.
  - f. Meeting stiles to include integral pocket to accept pile brush weather seal.
3. Corners.
- a. Mitered.
  - b. Secured with 3/8" diameter full-width steel tie rod through extruded splines top and bottom which are integral to standard tubular shaped rails.
  - c. 1-1/4" x 1-1/4" x 3/16" 6061 aluminum angle reinforcement at corner to give strong, flat surface for locking hex nut to bear on.
  - d. Weld, glue, or other methods of corner joinery are not acceptable.
4. Core.
- a. Poured-in-place polyurethane foam.
  - b. Laid in foam cores are not acceptable.
  - c. Foam Plastic Insulated Doors: IBC 2603.4.
    - 1. Foam plastic shall be separated from the interior of a building by an approved thermal barrier.
    - 2. Approved thermal barrier must meet the acceptance criteria of the Temperature Transmission Fire Test and Integrity Fire Test as stated in NFPA 275.
    - 3. IBC 2603.4.1.7 foam plastic insulation, having a flame spread index less than 75 and a smoke developed index of not more than 450 shall be permitted as a door core when the face is metal minimum 0.032" aluminum or 0.016" steel.
    - 4. Standard door assembly can be tested to show it meets these requirements without the use of thermal barrier. If no independent testing conducted all doors with foam plastic core must have a thermal barrier.
5. Face Sheet.
- a. Exterior
    - 1. 0.120" thick, pebble texture, through color with integral surfaseal film FRP sheet.
    - 2. Optional painted finish consult manufacturer.
    - 3. Class C standard.
  - b. Interior
    - 1. 0.120" thick, pebble texture, through color with integral surfaseal film FRP sheet.
    - 2. Optional painted finish consult manufacturer.
    - 3. Class C standard optional Class A available consult manufacturer.
  - c. Attachment of face sheet.
    - 1. Extruded stiles and rails to have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place and permit flush appearance.
    - 2. Use of glue to bond face sheet to core or extrusions is not acceptable.
6. Cutouts.
- a. Manufacture doors with cutouts for required vision lites, louvers, and panels.
7. Hardware.
- a. Pre-machine doors in accordance with templates from specified hardware manufacturers.

- b. Surface mounted closures will be reinforced for but not prepped or installed at factory.
  - c. Factory install door hardware.
  - 8. Reinforcements.
    - a. Aluminum extrusions made from 6061 or 6063 aluminum alloys.
    - b. Sheet and plate to conform to ASTM-B209.
    - c. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.
    - d. Bars and tubes to meet ASTM-B221.
  - D. Sustainability Characteristics.
    - 1. LEED Declaration.
      - a. Entrance Products contribute to point calculations for the following credits:
        - 1. MR Credit 4.1 Recycled Content 10% (post-consumer = ½ pre-consumer) 1 point.
        - 2. MR Credit 4.2 Recycled Content 20% (post-consumer = ½ pre-consumer) 1 point.
      - b. All aluminum extrusions are produced using prime-equivalent billet produced from 100% reprocessed 6063-T6 alloy recovered from industrial processes. The USGBC classifies these extrusions as pre-consumer recycled material.
      - c. Manufacturing facility located within 500 miles of major components and materials, including aluminum extrusions.
      - d. The point of recovery and smelting of pre-consumer recycled material within 500 miles of the manufacturing facility.
- 2.03 FRAMING – not used
- 2.04 PERFORMANCE
- A. Face Sheet.
    - 1. Standard Interior and Exterior Class C 0.120" thick, pebble texture, through color with integral surfaseal film FRP sheet.
      - a. Flexural Strength, ASTM-D790:  $21 \times 10^3$  psi.
      - b. Flexural Modulus, ASTM-D790:  $0.7 \times 10^6$  psi.
      - c. Tensile Strength, ASTM-D638:  $13 \times 10^3$  psi.
      - d. Tensile Modulus, ASTM-D638:  $1.2 \times 10^6$  psi.
      - e. Barcol Hardness, ASTM-D2583: 55.
      - f. Izod Impact, ASTM-D256: 14.0 ft-lb/in.
      - g. Gardner Impact Strength, ASTM-D5420: 120 in-lb.
      - h. Water Absorption, ASTM-D570: 0.20%/24hrs at 77°F.
      - i. Surface Burning, ASTM-E84: Flame Spread  $\leq 200$ , Smoke Developed  $\leq 450$ .
      - j. Taber Abrasion Resistance, Taber Test: 0.007% Max Wt. Loss, cs-17 wheels, 1000g. Wt., 25 cycles.
      - k. Chemical Resistance.
        - 1. Excellent Rating.
          - a. Acetic Acid, Concentrated.
          - b. Acetic Acid, 5%.
          - c. Bleach Solution.
          - d. Detergent Solution.
          - e. Distilled Water.
          - f. Ethyl Acetate.
          - g. Formaldehyde.
          - h. Heptane.
          - i. Hydrochloric Acid, 10%.
          - j. Hydrogen Peroxide, 3%.
          - k. Isooctane.
          - l. Lactic Acid, 10%.
      - l. USDA/FSIS Requirements.

1. FRP face sheet with surfaseal is a finished outer surface material that is rigid; durable; non-toxic; non-corrosive; moisture resistant; a light, solid color such as white; easily inspected; smooth or an easily cleaned texture.
  2. FRP face sheet with surfaseal does not contain any known carcinogen, mutagen, or teratogen classified as hazardous substances; heavy metals or toxic substances; antimicrobials; pesticides or substances with pesticidal characteristics.
2. Optional Interior Face Only Class A 0.120" thick, pebble texture, through color with integral surfaseal film FRP sheet.
    - a. Flexural Strength, ASTM-D790:  $13 \times 10^3$  psi.
    - b. Flexural Modulus, ASTM-D790:  $0.57 \times 10^6$  psi.
    - c. Tensile Strength, ASTM-D638:  $6.8 \times 10^3$  psi.
    - d. Tensile Modulus, ASTM-D638:  $0.90 \times 10^6$  psi.
    - e. Barcol Hardness, ASTM-D2583: 40.
    - f. Izod Impact, ASTM-D256: 12.0 ft-lb/in notched.
    - g. Gardner Impact Strength, ASTM-D3029: 45 in-lb.
    - h. Water Absorption, ASTM-D570: 0.32%/24hrs at 77°F.
    - i. Surface Burning, ASTM-E84: Flame Spread  $\leq 25$ , Smoke Developed  $\leq 450$ .
    - j. Taber Abrasion Resistance, Taber Test: 0.02% Max Wt. Loss, cs-17 wheels, 1000g. Wt., 25 cycles.
- B. Door Core.
1. Density, ASTM-D1622:  $\leq 5.0$  pcf.
  2. Compressive Properties, ASTM-D1621: Compressive Strength  $\geq 60$  psi, Compressive Modulus  $\geq 1948$  psi.
  3. Tensile and Tensile Adhesion Properties, ASTM-D1623: Tensile Adhesion, 3" x 3" FRP Facers  $\geq 53$  psi, Tensile Adhesion, 1" x 1" Foam  $\geq 104$  psi.
  4. Thermal and Humid Aging, ASTM-D2126: Volume Change at 158 °F, 100% humidity, 14 days  $\leq 13\%$ .
  5. Thermal Conductivity, ASTM-C518, Thermal Resistance  $\geq 0.10$  m<sup>2</sup>K/W.
- C. Door Panel.
1. Thermal Transmittance, AAMA 1503-98: U-Factor = 0.29 Btu/hr-ft<sup>2</sup>·°F, CRFp = 55.
  2. Indoor Air Quality, ASTM-D5116, ASTM-D6607: GreenGuard, GreenGuard Gold.
- D. Door and Aluminum Tube Frame Assembly.
1. Physical Endurance, ANSI A250.4: 25,000,000 Cycles, No Damage.
  2. Salt Spray, ASTM-B117: 500 hours minimum exposure.
  3. Air Leakage, NFRC 400, ASTM-E283.
    - a. Opaque Swinging Door (< than 50% glass)
      1. 0.01 cfm/sqft @ 1.57 psf.
      2. 0.01 cfm/sqft @ 6.24 psf.
    - b. Commercially Glazed Swinging Entrance Door (> than 50% glass)
      1. 0.38 cfm/sqft @ 1.57 psf.
      2. 0.73 cfm/sqft @ 6.24 psf.
  4. Structural Performance, ASTM E-330.
    - a. Single or Pair of Doors, 8'4" x 8'2" overall size, single point latching.
      1.  $\pm 75$  psf design pressure, pass.
  5. Impact and Cycle Test, ASTM-E1886.
    - a. Single or Pair of Doors, 6'8" x 7'8" overall size, 3-point latching.
      1. 9 lbs. missile @ 50 fps, minimum 3 impacts, no rips, tears, or penetrations.
      2.  $\pm 75$  psf design pressure, pass.
  6. Forced Entry, AAMA 1304.
    - a. Single or Pair of Doors, 6'8" x 7'8" overall size, 3-point latching.
      1. 300lb Pull Test, pass.
  7. Impact Test, TAS 201.
    - a. Single or Pair of Doors, 6'8" x 7'8" overall size, 3-point latching.
      1. 9 lbs. missile @ 50 fps, minimum 3 impacts, no rips, tears, or penetrations.

8. Static Air Pressure, TAS 202.
  - a. Single or Pair of Doors, 6'8" x 7'8" overall size, 3-point latching.
    1. ± 65 psf design pressure, pass.
    2. Forced Entry, 300lb Pull Test, pass.
9. Cyclic Wind Pressure Loading, TAS 203.
  - a. Single or Pair of Doors, 6'8" x 7'8" overall size, 3-point latching.
    1. ± 65 psf design pressure, pass.
10. Security Test, ASTM-F476: Minimum Grade 40.
11. Blast Test, ASTM-F1642.
  - a. 6 psi @ 45 psi-msec, minimal hazard, operable.
- E. Door and Thermally Broken Aluminum Frame Assembly.
  1. Thermal Transmittance, NFRC 100.
    - a. Opaque Swinging Door (< than 50% glass)
      1. U-Factor = 0.31 Btu/hr·ft<sup>2</sup>·°F.
    - b. Commercially Glazed Swinging Entrance Door (> than 50% glass)
      1. U-Factor = 0.64 Btu/hr·ft<sup>2</sup>·°F.
  2. Air Leakage, NFRC 400, ASTM-E283.
    - a. Opaque Swinging Door (< than 50% glass)
      1. 0.01 cfm/sqft @ 1.57 psf.
      2. 0.01 cfm/sqft @ 6.24 psf.
    - b. Commercially Glazed Swinging Entrance Door (> than 50% glass)
      1. 0.38 cfm/sqft @ 1.57 psf.
      2. 0.73 cfm/sqft @ 6.24 psf.
  3. Sound Transmission, ASTM-E90: STC = 30, OITC = 29.
- F. Door and AF-150 Frame Assembly.
  1. Thermal Transmittance, NFRC 100.
    - a. Opaque Swinging Door (< than 50% glass)
      1. U-Factor = 0.32 Btu/hr·ft<sup>2</sup>·°F.
    - b. Commercially Glazed Swinging Entrance Door (> than 50% glass)
      1. U-Factor = 0.57 Btu/hr·ft<sup>2</sup>·°F.
  2. Air Leakage, NFRC 400, ASTM-E283.
    - a. Opaque Swinging Door (< than 50% glass)
      1. 0.12 cfm/sqft @ 1.57 psf.
      2. 0.06 cfm/sqft @ 6.24 psf.
    - b. Commercially Glazed Swinging Entrance Door (> than 50% glass)
      1. 0.04 cfm/sqft @ 1.57 psf.
      2. 0.14 cfm/sqft @ 6.24 psf.
- G. Door and Hollow Metal Steel Frame.
  1. Cycle Slam, NWWDA T.M. 7-90.
    - a. 5,000,000 cycles.
      1. No Operational Damage.
      2. No Hinge Separation.
- H. AF-150 Framing.
  1. Tensile Strength, ASTM-D638: 15,900 psi.
  2. Tensile Modulus of Elasticity, ASTM-D638: 1.58 x 10<sup>6</sup> psi.
  3. Maximum Compressive Strength, ASTM-D695: 15,500 psi.
  4. Compressive Modulus of Elasticity, ASTM-D695: 6.7 x 10<sup>5</sup> psi.
  5. Flexural Strength, ASTM-D790: 39.3 x 10<sup>3</sup> psi.
  6. Flexural Modulus, ASTM-D790: 1.23 x 10<sup>6</sup> psi.
  7. Izod Impact, ASTM-D256: 8.1 ft-lb/in.
  8. Barcol Hardness, ASTM-D2583: 57.
  9. Specific Gravity, ASTM-D792: 1.45 @ 23 °C.
  10. Density, ASTM-D792: 1445.6 kg.m<sup>3</sup> @ 23 °C.
  11. Coefficient of Linear Expansion, ASTM-D696: 1.26 x 10<sup>-5</sup> in/in/°F.
  12. Short Beam Strength, ASTM-D2344: 3,980 psi.

13. Fastener Withdrawal, ASTM-D1761: 924 lbs.
14. Percent Fiberglass: 60%.

## 2.05 MATERIALS

- A. Aluminum Members.
  1. Aluminum extrusions made 6061 or 6063 aluminum alloys.
  2. Sheet and plate to conform to ASTM-B209.
  3. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.
- B. Fiberglass.
  1. See 2.02.C.5.
- C. Fasteners.
  1. All exposed fasteners will have a finish to match material being fastened.
  2. 410 stainless steel or other non-corrosive metal.
  3. Must be compatible with items being fastened.

## 2.06 FABRICATION

- A. Factory Assembly.
  1. Door and frame components from the same manufacturer.
  2. Required size for door and frame units, shall be as indicated on the drawings.
  3. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.
  4. All cut edges to be free of burs.
  5. Welding of doors or frames is not acceptable.
  6. Maintain continuity of line and accurate relation of planes and angles.
  7. Secure attachments and support at mechanical joints with hairline fit at contact surfaces.
- B. Shop Fabrication
  1. All shop fabrication to be completed in accordance with manufactures process work instructions.
  2. Quality control to be performed before leaving each department.

## 2.07 FINISHES

- A. Door.
  1. Aluminum.
    - a. Mill.
      1. AA-M10C22A21-Flash.
    - b. Anodizing.
      1. Class 1 Anodizing, minimum 0.7 mils thick.
        - a. Color.
          1. Clear 215 R1, AA-M10C12C22A41.
  2. FRP Face Sheets
    - a. Through color.
      1. Color.
        - a. Blue #5533.

## 2.08 ACCESSORIES

- A. Vision Lites.
  1. Factory Glazing.
    - a. Model.
      1. FL Standard.
    - b. Glazing Thickness.
      1. 1".
    - c. Rectangular Lites.
      - a. Size, as indicated on drawings.
  2. Rectangular Vision Lite Accessories.
    - a. Security Grate.
      1. SL-SG349.

- a. Frame perimeter is 1" x 1" x 1/8" steel angle.
      - b. Grate material is 14-gauge steel sheet perforated with 1/4" diameter round holes.
    - b. Vandal Screen.
      - 1. SL-SG350.
        - a. Frame perimeter is aluminum.
        - b. Screen material is 16-gauge stainless steel sheet perforated with 1/4" diameter round holes.
    - c. Louvers.
      - 1. Size, as indicated on drawings.
      - 2. Factory installed.
      - 3. 1" thick Y-Type fixed blade, 12" minimum from the bottom of the door.
      - 4. Exterior side of louver shall be free of fasteners.
      - 5. Optional insect screen.
    - d. Finish.
      - 1. Color.
  - 3. Other Shapes.
    - a. Attach drawing for vision lite shape.
- B. Hardware.
  - 1. Pre-machine doors in accordance with templates from specified hardware manufactures and hardware schedule.
  - 2. Factory install hardware.
  - 3. Hardware Schedule.
    - a. As specified in Section 08 71 00.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Examine areas to receive doors.
- B. Notify architect of conditions that would adversely affect installation or subsequent use.
- C. Do not proceed with installation until unsatisfactory conditions are corrected.

### 3.02 PREPARATION

- A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

### 3.03 ERECTION

- A. Install doors in accordance with manufacturer's instructions.
- B. Install doors plumb, level, square, true to line, and without warp or rack.
- C. Anchor frames securely in place.
- D. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by architect.
- E. Set thresholds in bed of mastic and back seal.
- F. Install exterior doors to be weathertight in closed position.
- G. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by architect.
- H. Remove and replace damaged components that cannot be successfully repaired as determined by architect.

### 3.04 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services.
  - 1. Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

### 3.05 ADJUSTING

- A. Adjust doors, hinges, and locksets for smooth operation without binding.

### 3.06 CLEANING

- A. Clean doors promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that would damage finish.

3.07 PROTECTION

- A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION 087143

## SECTION 083113 – ACCESS DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Flush access doors and frames for plumbing chase walls.
- B. Recessed drywall panel access doors for ceilings.

#### 1.02 SUBMITTALS

- A. Product Data: For each type of access door and frame indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each door face material in specified finish.
- D. Schedule: Types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

#### 1.03 QUALITY ASSURANCE

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
  - 1. UL 10B for vertical access doors and frames.

#### 1.04 COORDINATION

- A. If retaining this Article, also retain "Schedule" Paragraph in "Submittals" Article.
- B. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

### PART 2 - PRODUCTS

#### 2.01 STEEL MATERIALS

- A. Manufacturer's standard finish – No. 4 Stainless Steel Satin Finish.

#### 2.02 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Acudor Products, Inc.
  2. Babcock-Davis; A Cierra Products Co.
  3. Karp Associates, Inc.
  4. Larsen's Manufacturing Company.
  5. MIFAB, Inc.
- C. Flush Access Doors and Frames with Exposed Trim: Fabricated from metallic-coated steel sheet.
1. Locations: Plumbing chase walls.
  2. Door: Minimum 14 gage thick sheet metal.
  3. Frame: Minimum 16 gage.
  4. Hinges: Continuous concealed hinge.
  5. Latch: Stainless steel screwdriver operated cam latch.
  6. Lock: Cylinder.
  7. Basis of Design: Acudor UF-5000
  8. Size: As shown on drawings (10"x10" Minimum).
- D. Recessed 5/8" Drywall panel access door
1. Locations: Ceiling access doors.
  2. Door: Minimum 22 gage with satin coat.
  3. Frame: Minimum 22 gage with satin coat.
  4. Hinges: Concealed hinge.
  5. Latch: Slotted screwdriver operated cam latch.
  6. Lock: Cylinder lock and key.
  7. Door Recess: 5/8" to accept 5/8" drywall
  8. Basis of Design: Acudor DW-5015 recessed access door.
  9. Size: As shown on drawings (12"x12" Minimum).
- E. Fire Rated Access Door – 1 Hour Rated
1. Locations: Ceiling access doors.
  2. Door: Steel-22 Gauge recessed fitted with 5/8" thick drywall suitable to accept skim coat finish on site.

3. Frame: Steel-22 Gauge press bent for strength and rigidity with pre-punched flanges for convenient mounting and accepting skim coat finish on site
  4. Hinges: Concealed hinge.
  5. Fire Rating (Ceilings): Meets 90 minutes Fire Resistance Rating in accordance with CAN ULC S101-14, ASTM E119-16 and NFPA 251
  6. Latch: Self-latching bolt, operated by flush key.
  7. Finish: Satin coat Steel
  8. Basis of Design: Acudor FWC-5015
  9. Size: As shown on drawings (12"x12" Minimum).
- F. Fire Rated Access Door – 2 Hour Rated
1. Locations: Drywall Walls and Ceilings
  2. Door: 20 gauge, filled with 2" thick fire rated insulation, Mounting Frame: 16 gauge, flange to be drywall taping bead flange
  3. Hinges: Concealed hinge.
  4. Fire Rating: (Walls): UL — 1-1/2 hour "B" label. ULC — 2 hour "B" label. Max size: 36 x 48. (Ceilings): Warnock Hersey International 3 hour rated in a non-combustible ceiling. 1 hour rated in a combustible ceiling. Max size: 24 x 36
  5. Latch: Universal self-latching bolt, operated by either a knurled knob or flush key. Doors can be prepared for mortise cylinder locks (Master Keying).
  6. Finish: Steel: 5 stage iron phosphate preparation with prime coat of white baked-on enamel. Stainless Steel: #4 satin polish
  7. Basis of Design: Acudor FW-5050-DW
  8. Size: As shown on drawings: (24"x24" Minimum).

## 2.03 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, provide materials with smooth, flat surfaces without blemishes.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder lock, furnish two keys per lock and key all locks alike.
  2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.
- F. Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

### 3.02 ADJUSTING AND CLEANING

- 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 083113

## SECTION 085113 – ALUMINUM WINDOWS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes fixed and/or operable aluminum-framed windows for exterior locations.

#### 1.3 DEFINITIONS

- A. Performance class designations according to AAMA/WDMA/CSA 101/I.S.2/A440-08:
  - 1. AW: Architectural.
- B. Performance grade number according to AAMA/WDMA/CSA 101/I.S.2/A440-08:
  - 1. Design pressure number in pounds force per square foot (pascals) used to determine the structural test pressure and water test pressure.
- C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.
- D. Minimum Test Size: Smallest size permitted for performance class (gateway test size) or as specified elsewhere in this section, whichever is more stringent. Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class. Downsized test reports will not be considered acceptable.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of minimum test size indicated below:
  - 1. Windows: 60" x 99".
- B. Structural Performance: Provide aluminum windows capable of withstanding the effects of the following loads, based on testing units of the minimum test size specified herein that pass AAMA/WDMA/CSA 101/I.S.2/A440-08, Uniform Load Structural and Uniform Load Deflection Tests:
  - 1. Uniform Load Structural Test: 150 psf (positive and negative). Double Hung
  - 2. Uniform Load Deflection Test: 100 psf (positive and negative). Double Hung
  - 3. Uniform Load Structural Test: 225 psf (positive and negative). Fixed

4. Uniform Load Deflection Test: 150 psf (positive and negative). Fixed

## 1.5 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:
  1. Mullion details, including reinforcement and stiffeners.
  2. Joinery details.
  3. Weather-stripping details.
  4. Thermal-break details.
  5. Glazing details.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
  1. Include similar samples of hardware and accessories involving color selection.
- D. Maintenance Data: For operable window sash, operating hardware and finishes to include in maintenance manuals.
- E. Warranty: Special warranty specified in this Section.

## 1.6 QUALITY ASSURANCE

- A. Product Qualifications: In order to confirm that the proposed product(s) conform to the material and performance requirements contained in these specifications, bidders shall include the following with their bid. Failure to comply with these requirements shall cause the bid to automatically be rejected.
  1. Bidder's Acknowledgement: Bidders shall include a letter in their bid stating the manufacturer and series (model) number of the product upon which its bid has been based. Changes in product (manufacturer or series) will not be permitted after the bid.
  2. Product Test Reports: Bidders submitting bids based on products other than the Basis of Design product listed in Paragraph 2.1 must also include with their bid comprehensive test reports not more than four years old prepared by a qualified testing agency for each window type being used on the project. Test reports based on the use of downsized test units will not be accepted.
  3. Product Details: Bidders submitting bids based on products other than the Basis of Design product listed in Paragraph 2.1 must also include with their bid full size product details showing all frame and sash details, dimensions, thermal break construction, wall thicknesses and joinery. Details must accurately reflect all glazing and hardware options specified herein.
- B. Product Requirements: For maximum performance, windows for this project must meet both the testing requirements as contained herein and the minimum material

requirements specified. Windows that carry the applicable AAMA rating but do not meet the material thicknesses, depths, etc. shall not be acceptable for use on this project.

- C. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.
- D. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.
- E. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Do not modify size and dimensional requirements.
  - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- F. Fenestration Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440-08, "Standard/Specification for Windows, Doors, and Unit Skylights" for definitions and minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.
- G. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.
- H. Preinstallation Conference: If requested, conduct conference at project site to review methods and procedures related to aluminum windows including, but not limited to, the following:
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components.
  - 3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
  - 4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

## 1.7 PROJECT CONDITIONS

- A. Field Measurements: For retrofit installations, verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which 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, or air infiltration.
  - c. Faulty operation of movable sash and hardware.
  - d. Deterioration of metals or other materials beyond that which is normal.
  - e. Failure of insulating glass.
2. Warranty Period:
  - a. Window: Five years from date of Substantial Completion.
  - b. Balances: Class 6, Ten years from date of Substantial Completion.
  - c. Insulated Glazing: 10 years from date of Substantial Completion.
  - d. Painted Metal Finishes:
    - 1) Five years from date of Substantial Completion for AAMA 2603 Baked Enamel Finishes.
    - 2) Twenty years from date of Substantial Completion for AAMA 2605 Superior Performance Finishes.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: The basis of design for these specifications is the Series 4700i Double Hung Side Load and 7700i Fixed/Transom as manufactured by Architectural Window Manufacturing Corporation, Rutherford, New Jersey.
- B. Equivalents: Subject to compliance with all material and performance requirements outlined in these specifications, "or equal" products by other manufacturers will be considered for use subject to review by the Architect. The Architect's decision regarding equivalency is final.

### 2.2 MATERIALS

- A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength, not less than 16,000-psi (110-MPa) minimum yield strength, and not less than 0.080-inch (1.6-mm) thickness at any location for the main frame and sash members, except the frame sill which shall be a minimum of 0.125-inch.
- B. Frame/Sash Depth: 4 ¼" minimum frame depth; 1 ¾" minimum sash depth.
- C. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.
  1. All fasteners must be concealed except where unavoidable for application of hardware.
  2. For application of hardware, where required, use non-magnetic stainless steel phillips machine screws.

- D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
- E. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and for complete concealment when aluminum window is closed.
  - 1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA/CSA 101/I.S.2/A440-08.
- F. Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.
  - 1. Weather Seals: Provide weather stripping with integral barrier fin or fins of semirigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.
- G. Replaceable Weather Seals: Comply with AAMA 701/702.
- H. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, non-shrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

## 2.3 WINDOW

- A. Window Types: Double hung; Fixed and Transom
- B. AAMA/WDMA Performance Requirements: Provide aluminum windows of performance indicated that comply with AAMA/WDMA/CSA 101/I.S.2/A440-08.
  - 1. Performance Class and Grade: AW-PG100 Double Hung.
  - 2. Performance Class and Grade: AW-PG150 Fixed and Transom.
- C. Condensation-Resistance Factor (CRF): Provide aluminum windows tested with insulating glass for thermal performance according to AAMA 1503, showing a minimum CRF of 50.
- D. Thermal Transmittance: Provide aluminum windows with whole-window U-factor and SHGC maximums indicated when simulated in accordance with NFRC 100 and NFRC 200 at a model size of 48" x 72" and glazed with 1" Argon filled sputter coat Low-E (#2) insulated glass using a warm edge spacer.
  - 1. U-Factor: 0.45 Btu/sq. ft. x h x deg F and SHGC 0.28 or less for Double Hung.
  - 2. U-Factor: 0.38 Btu/sq. ft. x h x deg F and SHGC 0.34 or less for Fixed
- E. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/WDMA/CSA 101/I.S.2/A440-08, Air Infiltration Test.
  - 1. Maximum Rate: 0.25 cfm/sq. ft. (5 cu. m/h x sq. m) of area at an inward test pressure of 6.24 lbf/sq. ft. (300 Pa).

- F. Water Resistance: No water leakage as defined in AAMA/WDMA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/WDMA 101/I.S.2/NAFS, Water Resistance Test.
  - 1. Test Pressure: Not more than 15 lbf/sq. ft.
- G. Forced-Entry Resistance: Comply with Performance Grade 10 requirements when tested according to ASTM F 588.
- H. Life-Cycle Testing: Test according to AAMA 910 and comply with AAMA/WDMA/CSA 101/I.S.2/A440-08.
- I. Operating Force and Auxiliary (Durability) Tests: Comply with AAMA/WDMA/CSA 101/I.S.2/A440-08 for operating window types indicated.

## 2.4 INSULATED GLAZING

- A. Construction: All windows (except those receiving insulated panels) shall be factory glazed with hermetically sealed 1" insulating glass units with a dual seal of polyisobutylene and silicone and a desiccant filled spacer. Insulated glass must be set into a continuous bed of two-part structural silicone sealant and held in place with removable extruded aluminum snap-in beads. Wrap around (marine) glazing which requires the removal and disassembling of the sash for re-glazing will not be acceptable. Units must be IGCC certified for a CBA rating level.
  - 1. Exterior Glazing:
    - a. Thickness: 1/4"
    - b. Tint: Clear
    - c. Type: Tempered Glass
    - d. Coating: Guardian SuperNeutral 68, Vitro Solarban 60, Viracon VE-2M Low-E (or equal) (#2 Surface)
  - 2. Interior Glazing:
    - a. Thickness: 1/4"
    - b. Tint: Clear; Obscure in Locker rooms and Lavatories
    - c. Type: Tempered Glass
  - 3. Interspace Content: Argon
  - 4. Spacer Type: Warm Edge

## 2.5 HARDWARE

- A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals.
- B. Locks and Latches: Designed to allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
- C. Pole Operators: Tubular-shaped anodized aluminum; with rubber-capped lower end and standard push-pull hook at top to match hardware design; of sufficient length to operate

window without reaching more than 60 inches (1500 mm) above floor; 1 pole operator and pole hanger per room that has operable window hardware more than 72 inches (1800 mm) above floor.

D. Double-Hung Windows: Provide the following operating hardware:

1. Counterbalancing Mechanism: Comply with AAMA 902.
  - a. Sash Balance: Class 6, concealed Ultralift Extreme spring type capable of lifting 80% of sash weight, of size and capacity to hold sash stationary at any open position.
2. Removable Lift-out Sash: Design windows and provide with hardware to permit removal of sash from inside for cleaning. Units with tilt-in sash will not be acceptable.
3. Handle: Continuous, integral lift rail on bottom rail of lower sash and pull-down rail on top rail of upper sash.
4. Lower Sash Lock: Spring-loaded, snap-type white bronze lock on bottom rail of lower sash (two if window is greater than 48" wide).
5. Upper Sash Lock: Pole-operated snap type white bronze lock on top rail of upper sash.

## 2.6 INSECT SCREENS

- A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Locate screens on outside of window. Provide insect screens on all operable sash.
- B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
  1. Extruded-Aluminum Tubular Framing Sections and Cross Braces: Not less than 0.050-inch (1.3-mm) wall thickness.
  2. Finish: Match aluminum window members.
- C. Aluminum Wire Fabric: 18-by-16 (1.1-by-1.3-mm) mesh of 0.011-inch- (0.28-mm-) diameter, coated aluminum wire.
  1. Wire-Fabric Finish: Charcoal gray

## 2.7 ACCESSORIES

- A. Rescue Labels: Windows designated on drawings as "Rescue" or "Egress" windows shall meet all applicable codes and shall include a conforming label.

## 2.8 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

- B. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.
- C. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed (products with exposed thermal barriers will not be acceptable), 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.
  - 1. All exterior aluminum shall be separated from interior aluminum by a rigid, structural thermal barrier. For purposes of this specification, a structural thermal barrier is defined as a system that shall transfer shear during bending and, therefore, promote composite action between the exterior and interior extrusions.
  - 2. No thermal short circuits shall occur between the exterior and interior.
  - 3. The thermal barrier shall be INSULBAR® or equal and shall consist of two glass reinforced polyamide nylon 6/6 struts mechanically crimped in raceways extruded in the exterior and interior extrusions.
  - 4. Poured and debridged urethane thermal barriers shall not be permitted.
- D. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.
- E. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- F. 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.
- G. Subframes: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.093-inch- thick extruded aluminum. Finish to match window units. Provide subframes capable of withstanding design loads of window units.
- H. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section "Glass and Glazing" and with AAMA/WDMA/CSA 101/I.S.2/A440-08.
- I. Glazing Stops: Provide snap-on glazing stops coordinated with Division 08 Section "Glass and Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.
- J. Muntins: Where shown on drawings, muntins shall be 3/8" deep profiled extruded aluminum applied to the exterior of 1" deep insulating glass. Roll formed muntins shall not be acceptable. Exterior applied muntins, where applicable, must be pinned to an integral bevel on the frame or sash. Products using applied bevels will not be accepted.

## 2.9 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Exterior of Window:
  - 1. Superior-Performance Organic Finish: AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturer's written instructions.
    - a. Fluoropolymer Two-Coat System: Manufacturer's standard two-coat thermocured system consisting of specially formulated inhibitive primer [and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
    - b. Color: As selected by Architect from manufacturer's standard non-mica, non-exotic, non-metallic colors. (Note: Exterior color may be different from interior color.)
- D. Interior of Window:
  - 1. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.
    - a. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603.
    - b. Color: As selected by Architect from manufacturer's standard non-mica, non-exotic, non-metallic colors.

## PART 3 - EXECUTION

### 3.1 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 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, weathertight window installation.
  - 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
  - 2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
  - 3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.

4. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight 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.

### 3.3 FACTORY TESTING

- A. One window for each seventy-five manufactured shall be randomly selected by the Owner and Architect to be tested at the manufacturer's facility for air and water infiltration in order to confirm compliance of the project's windows with the performance requirements contained in these specifications. Bidders are to include the cost of transportation, food, and lodging for four representatives of the Owner and/or Architect to witness these tests.

### 3.4 FIELD QUALITY CONTROL

- A. Testing Agency: If desired, Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
  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, Test Method A. Field test pressures and allowable limits shall be as factored by AAMA 502 from those minimums required to determine laboratory compliance with the applicable Performance Class and Grade pursuant to AAMA/WDMA/CSA 101/I.S.2/A440-08.
  2. Testing Extent: One window as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested immediately after installation.
  3. Test Reports: Shall be prepared according to AAMA 502.
- C. Remediate noncomplying windows and retest as specified above.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of remediated doors or additional work with specified requirements.

### 3.5 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.
- B. Manufacturer shall clean all glass and aluminum prior to shipment.
- C. Protection of newly installed windows and/or final cleaning of glass and aluminum to remove any accumulations that may have occurred during the construction period is to be the responsibility of the General Contractor or Owner.
- D. Comply with manufacturer's written recommendations for final cleaning and maintenance.

### 3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain window operating system.

END OF SECTION 085113



## SECTION 087100 – DOOR HARDWARE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
  - 1. Swinging doors.
  - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
  - 1. Mechanical door hardware.
  - 2. Electromechanical door hardware.
  - 3. Automatic operators.
  - 4. Cylinders specified for doors in other sections.
- C. Related Sections:
  - 1. Division 08 Section "Hollow Metal Doors and Frames".
  - 2. Division 08 Section "Flush Wood Doors".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - 2. ICC/IBC - International Building Code.
  - 3. NFPA 70 - National Electrical Code.
  - 4. NFPA 80 - Fire Doors and Windows.
  - 5. NFPA 101 - Life Safety Code.
  - 6. NFPA 105 - Installation of Smoke Door Assemblies.
  - 7. UL/ULC and CSA C22.2 – Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
  - 8. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards:
  - 1. ANSI/BHMA Certified Product Standards - A156 Series
  - 2. UL10C – Positive Pressure Fire Tests of Door Assemblies

### 1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  - 3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
    - h. Warranty information for each product.
  - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
  - 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
    - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    - b. Complete (risers, point-to-point) access control system block wiring diagrams.
    - c. Wiring instructions for each electronic component scheduled herein.
  - 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
  - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
  - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
  - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- F. Keying Conference: Conduct keying conference to incorporate the following criteria into the final keying schedule document:
  - 1. Function of building, purpose of each area and degree of security required.
  - 2. Plans for existing and future key system expansion.
  - 3. Requirements for key control storage and software.

4. Installation of permanent keys, cylinder cores and software.
  5. Address and requirements for delivery of keys.
- G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
  2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
  3. Review sequence of operation narratives for each unique access controlled opening.
  4. Review and finalize construction schedule and verify availability of materials.
  5. Review the required inspecting, testing, commissioning, and demonstration procedures
- H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

#### 1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

## 1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of the hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
  - 1. Ten years for mortise locks and latches.
  - 2. Seven years for heavy duty cylindrical (bored) locks and latches.
  - 3. Five years for exit hardware.
  - 4. Fifteen years for manual surface door closer bodies.
  - 5. Two years for electromechanical door hardware.

## 1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

## PART 2 - PRODUCTS

### 2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
  - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in

writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

## 2.2 HANGING DEVICES

### A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:
  - a. Two Hinges: For doors with heights up to 60 inches.
  - b. Three Hinges: For doors with heights 61 to 90 inches.
  - c. Four Hinges: For doors with heights 91 to 120 inches.
  - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
  - a. Widths up to 3'0": 4-1/2" heavy weight.
  - b. Sizes from 3'1" to 4'0": 5" heavy weight.
3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
  - a. Exterior and Interior (wet area) Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
  - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
4. Hinge Options: Comply with the following:
  - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
5. Manufacturers:
  - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - TA Series.

### B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:
  - a. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

## 2.3 POWER TRANSFER DEVICES

- A. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
1. Provide one each of the following tools as part of the base bid contract:
    - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.
    - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.
  2. Manufacturers:
    - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) – QC-C Series.

## 2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
  2. Furnish dust proof strikes for bottom bolts.
  3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
  4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
  5. Manufacturers:
    - a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
- B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
  2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
  3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
  4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Manufacturers:
  - a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

## 2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- C. Cylinders: Original manufacturer cylinders complying with the following:
  1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
  2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
  4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
  5. Keyway: Match Facility Standard.
- D. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
  1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- E. Keying System: Each type of lock and cylinders to be factory keyed.
  1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
  2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
  3. Existing System: Field verify and key locks to match Owner's existing system.
- F. Key Quantity: Provide the following minimum number of keys:
  1. Change Keys per Cylinder: Two (2)
  2. Master Keys (per Master Key Level/Group): Five (5).
  3. Construction Keys (where required): Ten (10).
  4. Construction Control Keys (where required): Two (2).
  5. Permanent Control Keys (where required): Two (2).
- G. Construction Keying: Provide construction master keyed cylinders.
- H. Construction Keying: Provide temporary keyed construction cores.
- I. Key Registration List (Bitting List):
  1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
  2. Provide transcript list in writing or electronic file as directed by the Owner.

- J. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

- a. Lund Equipment (LU).
- b. MMF Industries (MM).
- c. Telkee (TK).

- K. Key Control Software: Provide one network version of "Key Wizard" branded key management software package that includes one year of technical support and upgrades to software at no charge. Provide factory key system formatted for importing into "Key Wizard" software.

## 2.6 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Manufacturers:

- a. Corbin Russwin Hardware (RU) – ML2000 Series.
- b. Sargent Manufacturing (SA) – 8200 Series.

- B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.

1. Furnish with solid cast levers, standard 2 3/4" backset, and 1/2" (3/4" at paired openings) throw brass or stainless steel latchbolt.
2. Locks are to be non-handed and fully field reversible.
3. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.2 requirements to 2 million cycles.
4. Manufacturers:

- a. Corbin Russwin Hardware (RU) – CL3300 Series.
- b. Sargent Manufacturing (SA) – 10 Line.

## 2.7 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.

3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

## 2.8 ELECTRIC STRIKES

- A. Surface Mounted Rim Electric Strikes: Surface mounted rim exit device electric strikes conforming to ANSI/BHMA A156.31, Grade 1, and UL Listed for both Burglary Resistance and for use on fire rated door assemblies. Construction includes internally mounted solenoid with two heavy-duty, stainless steel locking mechanisms operating independently to provide tamper resistance. Strikes tested for a minimum of 500,000 operating cycles. Provide strikes with 12 or 24 VDC capability supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike. Strike requires no cutting to the jamb prior to installation.

1. Manufacturers:

- a. HES (HS) - 9500/9600 Series.

- B. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

## 2.9 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
3. Except on fire rated doors, provide exit devices with key cylinder dogging device to hold the pushbar and latch in a retracted position.
4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

5. Flush End Caps: Provide flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.
  6. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
  7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
    - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
  8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
  9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
  10. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
  11. Rail Sizing: Provide exit device rails factory sized for proper door width application.
  12. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
    - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
    - b. Sargent Manufacturing (SA) - 80 Series.
- C. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.
1. Provide keyed removable feature where specified in the Hardware Sets.
  2. Provide stabilizers and mounting brackets as required.
  3. Provide electrical quick connection wiring options as specified in the hardware sets.
  4. Manufacturers:
    - a. Corbin Russwin Hardware (RU) - 700/900 Series.
    - b. Sargent Manufacturing (SA) - 980S Series.

## 2.10 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
  2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
  3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
  4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
  5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
  6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
  7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
1. Manufacturers:
    - a. Norton Door Controls (NO) - 7500 Series.
    - b. Sargent Manufacturing (SA) - 281 Series.

## 2.11 ELECTROHYDRAULIC DOOR OPERATORS

- A. General: Provide low energy operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.
1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.
- B. Standard: Certified ANSI/BHMA A156.19.

- C. Performance Requirements:
  - 1. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
  - 2. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.
- D. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.
- E. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19. When not in automatic mode, door operator to function as manual door closer with fully adjustable opening and closing forces, with or without electrical power.
- F. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.
- G. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.
- H. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.
- I. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Norton Door Controls (NO) - 6000 Series.

## 2.12 ARCHITECTURAL TRIM

- A. Door Protective Trim
  - 1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
  - 2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
  - 3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
  - 4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:

- a. Stainless Steel: 300 grade, 050-inch thick.
- 5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
- 6. Manufacturers:
  - a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

## 2.13 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
  - 1. Manufacturers:
    - a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
  - 1. Manufacturers:
    - a. Rixson Door Controls (RF).
    - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    - c. Sargent Manufacturing (SA).

## 2.14 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
  - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
  1. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

#### 2.15 ELECTRONIC ACCESSORIES

- A. Switching Power Supplies: Provide switching power supplies that are dual voltage, UL listed, supervised units. Units shall be field selectable with a dedicated battery charging circuit that provide 4 Amp at 12VDC or 24VDC continuous, with up to 16 independently controlled power limited outputs. Units shall tolerate brownout or overvoltage input  $\pm 15\%$  of nominal voltage and have thermal shutdown protection with auto restart. Circuit breaker shall protect against overcurrent and reverse battery faults and units shall be available with a single relay fire trigger or individually triggered relayed outputs. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw plus 50% for the specified electrified hardware and access control equipment.
  1. Manufacturers:
    - a. Securitron (SU) - AQ Series.

#### 2.16 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

#### 2.17 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

### 3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

### 3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
  - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
  - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
  - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
  - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Power Operator products and accessories are required to be installed through current members of the manufacturer's "Power Operator Preferred Installer" program.
- D. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

- F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

### 3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch-Out Report): Reference Division 01 Section "Closeout Procedures". Final inspect installed door hardware and state in report whether work complies with or deviates from specification requirements, including whether door hardware is properly installed, operating and adjusted.

### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

### 3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

### 3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

### 3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.

C. Manufacturer's Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood
4. SA - SARGENT
5. HS - HES
6. RF - Rixson
7. NO - Norton
8. SU - Securitron
9. OT - Other

**Hardware Sets**

**Set: 1.0**

Description: Vestibule Pair - Remote Release

2	Continuous Hinge	CFM-HD1 Series		PE
1	Key Removable Mullion	L980S	PC	SA
1	Exit Device (rim, NL, CD)	16 72 8804 862	US32D	SA
1	Exit Device (rim, EO, CD)	16 72 8810 862	US32D	SA
4	Core (SFIC)	Keyed to existing system	US26D	00
1	Electric Strike	9600-LBM	630	HS
1	SMART Pac Bridge Rectifier	2005M3		HS
1	Surface Closer	R / PR 7500 Series	689	NO
1	Automatic Opener	6061; 6071	689	NO
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO
2	Door Stop	401; 404; 441CU (or per spec)	US26D	RO
1	Threshold (coord w/ details)	271A FHSL14SS		PE
1	Mullion Gasket	5110BL		PE
2	Silencer	608		RO
1	Wire Harness (head/jamb to J-box)	QC-C3000P		MK
1	Mullion Wire Harness	QC-C1500 (coord molex connectors)		MK
2	Door Switch	501		NO
1	Power Supply	AQD4 Series		SU
1	Remote Release Switch	By Security Vendor		00
1	Card Reader	By Security Vendor		OT

Notes:

Operation: Door is normally closed and locked. Valid card at reader or signal from remote switch unlocks door for momentary access, then enables outside actuator. Inside actuator unlocks, then auto opens door. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire detection/suppression systems are activated. Outside key override.

**Set: 2.0**

Description: Exterior Sgl - Card Access

1	Continuous Hinge	CFM-HD1 Series		PE
1	Exit Device (rim, NL, CD)	16 72 8804	US32D	SA
2	Core (SFIC)	Keyed to existing system	US26D	00
1	Electric Strike	9600-LBM	630	HS
1	SMART Pac Bridge Rectifier	2005M3		HS
1	Surface Overhead Stop	9-X36	630	RF
1	Surface Closer (offset)	PR7500 2018S	689	NO
1	Threshold (coord w/ details)	273x292AFGPK FHSL14SS-2		PE

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1 Head & Jamb Gasketing	2891APK	PE
1 Sweep	3452APK	PE
1 Wire Harness (head/jamb to J-box)	QC-C3000P	MK
1 Power Supply	AQD4 Series	SU
1 Card Reader	By Security Vendor	OT
1 Flush Pull	By door mfg	

Notes:

Operation: Door is normally closed and locked. Valid card at reader unlocks door for momentary access. During a loss of power the door will default to secure. Free egress at all times. Lock status will not change when the fire detection/suppression systems are activated. Outside key override.

**Set: 3.0**

Description: Corridor Sgl - Passage

3 Hinge (heavy weight)	T4A3786 (qty, size, nrp per spec)	US26D	MK
1 Passage Latch	10U15 LL	US26D	SA
1 Surface Closer	R / PR 7500 Series	689	NO
1 Kick Plate	K1050 10" 4BE CSK	US32D	RO
1 Door Stop	401; 404; 441CU (or per spec)	US26D	RO
1 Head & Jamb Seal (adhesive)	S88BL		PE

**Set: 4.0**

Description: Classroom

3 Hinge (heavy weight)	T4A3786 (qty, size, nrp per spec)	US26D	MK
1 Classroom Security Lock	72 10G38 LL	US26D	SA
2 Core (SFIC)	Keyed to existing system	US26D	00
1 Surface Closer	R / PR 7500 Series	689	NO
1 Kick Plate	K1050 10" 4BE CSK	US32D	RO
1 Door Stop	401; 404; 441CU (or per spec)	US26D	RO
1 Head & Jamb Seal (adhesive)	S88BL		PE

**Set: 5.0**

Description: Locker Room; Toilet Vest

3 Hinge (heavy weight)	T4A3386 (qty, size, nrp per spec)	US32D	MK
1 Classroom Lock	72 10G37 LL	US26D	SA
1 Core (SFIC)	Keyed to existing system	US26D	00
1 Surface Closer	R / PR 7500 Series	689	NO
1 Kick Plate	K1050 10" 4BE CSK	US32D	RO
1 Door Stop	401; 404; 441CU (or per spec)	US26D	RO
3 Silencer	608		RO

**Set: 6.0**

Description: Gym Storage

3 Hinge (heavy weight)	T4A3786 (qty, size, nrp per spec)	US26D	MK
1 Storeroom Lock (less outside trim)	72 8206 LNL	US26D	SA
1 Core (SFIC)	Keyed to existing system	US26D	00
1 Cylinder Pull	90	US32D	RO
1 Surface Closer	R / PR 7500 Series	689	NO
1 Kick Plate	K1050 10" 4BE CSK	US32D	RO
1 Door Stop	401; 404; 441CU (or per spec)	US26D	RO
3 Silencer	608		RO

**Set: 7.0**

Description: Office

3 Hinge (heavy weight)	T4A3786 (qty, size, nrp per spec)	US26D	MK
1 Office Lock	72 10G05 LL	US26D	SA
1 Core (SFIC)	Keyed to existing system	US26D	00
1 Kick Plate	K1050 10" 4BE CSK	US32D	RO
1 Door Stop	401; 404; 441CU (or per spec)	US26D	RO
3 Silencer	608		RO

**Set: 8.0**

Description: Classroom Closet

3 Hinge (heavy weight)	T4A3786 (qty, size, nrp per spec)	US26D	MK
1 Classroom Lock	72 10G37 LL	US26D	SA
1 Core (SFIC)	Keyed to existing system	US26D	00
1 Kick Plate	K1050 10" 4BE CSK	US32D	RO
1 Door Stop	401; 404; 441CU (or per spec)	US26D	RO
3 Silencer	608		RO

**Set: 9.0**

Description: Closet Pair

6 Hinge (heavy weight)	T4A3786 (qty, size, nrp per spec)	US26D	MK
1 Dust Proof Strike	570	US26D	RO
2 Flush Bolt (manual)	555	US26D	RO
1 Storeroom Lock	72 10G04 LL	US26D	SA
1 Core (SFIC)	Keyed to existing system	US26D	00
1 Surface Closer	R / PR 7500 Series	689	NO
2 Kick Plate	K1050 10" 4BE CSK	US32D	RO
2 Door Stop	401; 404; 441CU (or per spec)	US26D	RO
2 Silencer	608		RO

**Set: 10.0**

Description: Mechanical Room Pair

6 Hinge (heavy weight)	T4A3786 (qty, size, nrp per spec)	US26D	MK
1 Key Removable Mullion	12-L980	PC	SA
1 Exit Device (rim, exit only)	12 8810 EO	US32D	SA
1 Exit Device (rim, storeroom)	12 72 8806 ETL	US32D	SA
2 Surface Closer	R / PR 7500 Series	689	NO
2 Kick Plate	K1050 10" 4BE CSK	US32D	RO
2 Door Stop	401; 404; 441CU (or per spec)	US26D	RO
1 Threshold (coord w/ details)	271A FHSL14SS		PE
1 Mullion Gasket	5110BL		PE
1 Head & Jamb Seal (adhesive)	S88BL		PE
1 Astragal (adhesive, edge mount)	S771C		PE

**Set: 11.0**

Description: Jan Closet

3 Hinge (heavy weight)	T4A3786 (qty, size, nrp per spec)	US26D	MK
1 Storeroom Lock	72 10G04 LL	US26D	SA
1 Core (SFIC)	Keyed to existing system	US26D	00
1 Surface Closer	R / PR 7500 Series	689	NO

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1 Kick Plate	K1050 10" 4BE CSK	US32D	RO
1 Door Stop	401; 404; 441CU (or per spec)	US26D	RO
3 Silencer	608		RO

**Set: 12.0**

Description: Toilet Room - Single User

3 Hinge (heavy weight)	T4A3386 (qty, size, nrp per spec)	US32D	MK
1 Privacy Lock	10U65 LL	US26D	SA
1 Surface Closer	R / PR 7500 Series	689	NO
1 Kick Plate	K1050 10" 4BE CSK	US32D	RO
1 Door Stop	401; 404; 441CU (or per spec)	US26D	RO
3 Silencer	608		RO
1 Coat Hook	806	US26D	RO

**Set: 13.0**

Description: Toilet Room - Multi-User

3 Hinge (heavy weight)	T4A3386 (qty, size, nrp per spec)	US32D	MK
1 Push Pull	111x73C/73CL	US32D	RO
1 Surface Closer	R / PR 7500 Series	689	NO
1 Kick Plate	K1050 10" 4BE CSK	US32D	RO
1 Door Stop	401; 404; 441CU (or per spec)	US26D	RO
3 Silencer	608		RO

END OF SECTION 087100



## SECTION 088100 – GLASS AND GLAZING

### PART 1 - GENERAL

#### 1.1 GENERAL PROVISIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Carefully review and examine all other Contract Documents for requirements therein affecting the work of this Section. Furthermore, coordinate and sequence the work of this Section with all other trades affected.

#### 1.2 SUMMARY

- A. This Section includes glass and glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  - 1. Interior and exterior hollow metal doors and fixed frames.
  - 2. Interior and exterior Aluminum doors and frames.
  - 3. Interior and exterior Aluminum store front windows and curtain wall.
  - 4. Interior wood doors.

#### 1.3 RELATED WORK

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 8 Section "Hollow Metal Doors and Frames": for steel doors and fixed hollow metal framed openings receiving glass and glazing.
  - 2. Division 8 Section "Flush Wood Doors": for wood doors vision lites receiving glass and glazing.

#### 1.4 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Division 01 Section "References". Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. ASTM C 1036 - Flat Glass.

2. ASTM C 1048 - Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
  3. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
  4. Federal Safety Standards for Architectural Glazing Materials 16CFR1201-I.II.
- B. The following reference materials are hereby made a part of this Section by reference thereto:
1. FGMA - Glazing Manual, and Sealant Manual.
  2. Consumer Product Safety Commission-Safety Standard for Architectural Glazing Materials.

#### 1.5 SUBMITTALS

- A. Submit the following under provisions of Division 01 Section "Submittal Procedures".
1. Product data sheets on glazing products: Provide chemical, functional, and environmental characteristics, size limitations, special application requirements. Identify available colors.
  2. Warranty: Provide copies of manufacturers' actual warranties for all materials to be furnished under this Section, clearly defining all terms, conditions, and time periods for the coverage thereof
  3. Samples:
    - a. 12 by 12 inch pieces of each specified type and thickness of glass, bearing labels indicating locations where each type of glass will be used.
    - b. Glazing tape: 12 inch length of specified type and size.

#### 1.6 QUALITY ASSURANCE:

- A. Source: For each glass and glazing type required for work of this Section, provide primary materials which are products of one manufacturer. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.
- B. Installer: A firm with a minimum of three years' experience in type of work required by this Section and which is acceptable to manufacturers of primary materials.
- C. Glass Thickness: Determine and provide size and thickness of glass products that are certified to meet or exceed performance requirements specified in this Section. Provide units with proper thickness, edge clearance and tolerance to comply with recommendations of glass manufacturer.
- D. Perform work in accordance with FGMA Glazing Manual Sealant Manual.

#### 1.7 EXAMINATION OF SITE AND DOCUMENTS

- A. The bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. The Awarding Authority will not be responsible for errors, omissions and/or charges for extra work arising from General Contractor's or Subcontractor's failure to familiarize themselves with the contractor documents or site conditions. By submitting a bid, the bidder agrees and warrants that he has had the opportunity to examine the site and the contract documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the contract documents are adequate and that he will produce the required results.
- B. Pre-Bid Conference: Pre-Bid conference will be held on site; refer to Advertisement for Bids for time and date.

#### 1.8 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 liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 50°F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

#### 1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations and FGMA Manual.
  - 1. Protect materials from moisture, sunlight, excess heat, sparks and flame.
  - 2. Sequence deliveries to avoid delays but minimize on-site storage.

#### 1.10 WARRANTIES

- A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.
- B. Manufacturer's Special Project Warranty on Laminated Glass:
  - 1. Warranty Period: Manufacturer's standard but not less than 5 years after date of substantial completion.

### PART 2 PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

## 2.2 GLASS - GENERAL

- A. General requirements for glass: Of domestic manufacture, conforming to the referenced standards and with the additional requirements specified herein; factory labeled on each pane stating the strength, type, thickness and quality; with all labels remaining on glass until final cleaning.
- B. Fabricate glass as required to openings with edge clearances and bite on glass as recommended by the manufacturer with clean-cut edges where concealed, and smooth ground, polished and seamed edges where exposed to view. Do not cut, seam, nip or abrade glass after tempering.
  - 1. For non-tempered to be cut at site, provide glass larger than required so as to obtain clean cut edges without seaming or nipping. Laminated glass products should not be cut on site.
- C. Glass thickness shown, and heat treatment specified are minimum requirements. Provide glass thickness and heat treatment as required to meet specified performance criteria, State and local codes and ordinances.

## 2.3 NON-SECURITY GLASS TYPES

- A. Tempered Float Glass; ASTM C 1048, Kind FT, Condition A, Type I, Class 1, tempered by the manufacturer's standard process (after cutting to final size).
  - 1. Thickness: 1/4 inch.
  - 2. Manufacturers:
    - a. Pilkington North America
    - b. PPG Industries, Inc, Glass Group, Pittsburgh, PA.
    - c. NSG Group, Toledo, OH.
    - d. or equal
- B. Laminated Safety Glass; two sheets of double-strength clear sheet glass; ASTM C 1036, Type I, Class 1, quality q3; permanently laminated together with a minimum 0.030 inch thick sheet of clear plasticized polyvinyl butyl, which has been produced specifically for laminating glass.
  - 1. Thickness: 1/4 inch.
  - 2. Manufacturers:
    - a. Pilkington North America
    - b. PPG Industries, Inc., Glass Group, Pittsburgh, PA.
    - c. LTI Group, Pittsfield MA
    - d. or equal

- C. Laminated Noise-Reducing Glass; ASTM C 1036, Type I, applicable Class for glass indicated below, quality q3; provide the following components to produce units of the thickness and light transmittance indicated, tested and certified to provide the indicated STC rating for the sizes required in accordance with ASTM E 90.
1. Exterior Glass: Tempered glass.
  2. Laminating Sheet: Acoustic PVB sheet, minimum 0.045 inch thick.
  3. Interior Glass: Laminated glass.
  4. Manufacturers:
    - a. Pilkington North America
    - b. PPG Industries, Inc., Glass Group, Pittsburgh, PA.
    - c. LTI Group, Pittsfield MA
    - d. or equal
- D. Organically Sealed Insulating Glass Units; ASTM C 1036, applicable Type and Class for glass indicated below, quality q3 for Type I glass; manufacturer's standard edge construction of spacers and sealants permanently bonded to glass surfaces and hermetically sealed to provide a dehydrated air space 1/2 inch thick with -60 degrees F. dew point; fabricated of the following glass.
1. Exterior Glass: Tempered float glass.
  2. Interior Glass: Laminated glass.
  3. Glass Thickness(es): As indicated on the Drawings.
  4. Manufacturers:
    - a. Pilkington North America
    - b. PPG Industries, Inc., Glass Group, Pittsburgh, PA.
    - c. NSG Group, Toledo, OH.
    - d. LTI Group, Pittsfield, MA
    - e. or equal

## 2.4 SINGLE PANE SECURITY GLASS TYPES

- A. Product established as performance standard. Substitution must provide certified independent testing of performance data equal to specified product (see 2.6 for further details).
- B. Security Glazing.
1. Basis-of-Design Product: SG4 by School Guard Glass as manufactured by Laminated Technologies Inc. (844) 744-5277 or equal.
    - a. Security glazing shall have the following characteristics
      - i. No more than 4.1 lbs. per square foot
      - ii. 5-aa1 rated for a minimum of 6 minutes

- iii. Glass clad on interior and exterior surfaces
- iv. Optical Haze of no more than 1.8%

## 2.6 SECURITY GLASS TESTING METHODOLOGY FOR "OR EQUAL SUBSTITUTION"

- A. Security Glazing: Security glass and surrounding frames shall demonstrate the ability, through independent third-party testing, to provide the following attributes:
1. Products will be tested as a whole system, including glass and doors or frames.
  2. Products tested shall be tested in full size, actual doors and framing members usable in a commercial setting, as applicable to project requirements, with security glazing installed as prescribed by the security glazing manufacturer. Testing shall not be done in framing other than what is specified in regard to quality or manufacturer as stated in the Contract Documents.
  3. Glass bite during testing shall be no more than the allowable glass bite in the specified door or framing system for this project.
  4. The security glass shall resist attack for a minimum of 6 minutes or greater to meet the desired level of protection required by the owner.
  5. Attack duration shall be continuous. Breaks between testing phases shall not be counted or timed for total duration.
  6. Security glass will be integrated into a framing system in such a way that the frame and glass are able to withstand a constant attack for 6 minutes.
  7. Attack resistance shall mean the security glazing is subjected to the following without failure:
    - a. Withstand a minimum of 5 shots from a military style assault rifle with a minimum caliber of 7.62mm.
    - b. Withstand a minimum of abuse as applied by a single assailant at full force and including strikes with feet, bricks, hammers, baseball bats, and sledgehammers without stoppage for 6 or 12 minutes.
  8. Failure is defined as a tear in the security glass large enough to allow an object 4-inches in diameter or more to pass through or separation made between the glass and surrounding door frame, storefront or curtain wall framing materials.
  9. Product shall not be damaged or scratched by scissors, writing implements, razor blades or the use of any similar sharp object.
  10. Glass shall not have an optical haze of more than 1.8% so glass is indistinguishable from standard tempered glass.
- B. Test reports from a recognized independent testing company shall show testing means and methodology consistent or similar to the 5-aa1 assault test.

## 2.7 GLAZING MATERIALS

- A. Glazing Material: Silicone Rubber Glazing Sealant; silicone rubber one-part elastomeric sealant; FS TT-S-001543, Class A; acid-type for non-porous channel surfaces, and nonacid type where any of the channel surfaces are porous.
  - 1. Manufacturers and Products:
    - a. "995" by Dow Corning.
    - b. or equal.
- B. Preformed Butyl Rubber Glazing Sealant; tape or ribbon (coiled on release paper) of polymerized butyl, or mixture of butyl and polyisobutylene, compounded with inert fillers and pigments, solvent-based with minimum 95 percent solids, thread or fabric reinforcement, tack-free within 24 hours, paintable, non-staining.
- C. Molded Neoprene Glazing Gaskets; molded or extruded neoprene gaskets of the profile and hardness required for watertight construction; ASTM D 2000 designation 2BC 415 to 3BC 620.
- D. Pure silicone caulk, closed cell PVC tape, or DAP 33 putty as recommended by Technical Glass Products to comply with U.L. Listing. Must be used for fire-rated glass to meet fire rated labeling requirements.
- E. Colors: For exposed materials provide color as indicated or, if not indicated, as selected by the Director from the manufacturer's standard colors. For concealed materials, provide any of the manufacturer's standard colors.
- F. Setting Blocks: Neoprene, 70-90 durometer hardness, with proven compatibility with sealants used.
- G. Spacers: Neoprene, 40-50 durometer hardness, with proven compatibility with glazing materials used.
- H. Compressible Filler Rod: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, proven to be compatible with glazing materials used, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.
- I. Cleaners, Primers and Sealers: Type recommended by glazing material manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION AND PREPARATION

- A. Inspect receiving surfaces and ensure that are dry and free from dust, or other foreign materials before glazing. Clean all surfaces with cloth saturated with mineral spirits of high-flash naphtha as recommended by glazing tape manufacturer, before glazing.
- B. Check all openings, prior to glazing, to make certain that the opening is square, plumb and secure in order that uniform face and edge clearances are maintained.
- C. Determine the actual sizes required by measuring the receiving openings. Size glass and

mirrors to permit required clearance and bite around full perimeter of glass, as set forth in the referenced FGMA standards, or as recommended by the glass manufacturer. Do not nip edges, to remove flares or to reduce oversize dimensions, under any circumstance.

- D. Perform glazing work in accordance with FGMA Glazing Manual SIGMA and LSGA standards for glazing and installations methods.

### 3.2 INSTALLATION

- A. Each installation shall withstand normal temperature changes, applicable wind loading, and impact loading (for operating sash and doors) without failure of any kind including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the Work.
- B. Install glass in accordance with the standards detailed in the "Glazing Manual" of the Glass Association of North America and the "Sealant Manual" of the Flat Glass Marketing Association except as shown and specified otherwise, and except as specifically recommended otherwise by the manufacturers of the glass and glazing materials.
- C. Unify appearance of each series of lights by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw and bow oriented in the same direction as other pieces.
- D. Install glazing materials in accordance with the manufacturer's printed instructions.

### 3.3 GLAZING

- A. Install setting blocks of proper size at quarter points of sill rabbet. If required to keep in place set blocks in thin course of the heel-bead compound.
- B. Provide spacers inside and out, and of proper size and spacing, for all glass sizes larger than 50 united inches, except where gaskets are used for glazing. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
- C. Voids and Filler Rods: Prevent exudation of sealant or compound by forming voids or installing filler rods in the channel at the heel of jambs and head (do not leave voids in the sill channels) except as otherwise indicated, depending on light sizes, thickness and type of glass, and complying with manufacturer's recommendations.
- D. Do not cut, seam, nip, or abrade glass which is tempered, heat strengthened, or coated.
- E. Force glazing materials into channel to eliminate voids and to ensure complete "wetting" or bond of glazing material to glass and channel surfaces.
- F. Tool exposed surfaces of glazing sealants and compounds to provide a substantial "wash" away from the glass. Install pressurized tapes and gaskets to protrude slightly out of the channel, so as to eliminate dirt and moisture pockets.
- G. Where wedge-shaped gaskets are driven into one side of the channel to pressurize the sealant or gasket on the opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when subjected to dynamic movement. Anchor gasket to stop

with matching ribs, or by proven adhesives, including embedment of gasket tail in cured heel bead.

- H. Gasket Glazing: Miter cut and bond ends together at corners where gaskets are used for channel glazing, so that gaskets will not pull away from corners and result in voids or leaks in the glazing system.

### 3.4 CURE, PROTECTION AND CLEANING

- A. Cure glazing materials in accordance with manufacturer's printed instructions and recommendations, to obtain high early bond strength, internal cohesive strength, and surface durability.
- B. Mark glazed openings immediately upon installation of glass by attaching crossed streamers to framing. Do not apply markers of any type to surfaces of glass.
- C. Replace glass included in the work which is broken, or otherwise damaged, from the time Work is started at the site until the date of physical completion.
- D. Maintain glass in a reasonably clean condition during construction to protect from buildup of harmful construction contaminants.
  - 1. Clean and trim excess glazing material from the glass and stops or frames promptly after installation.
- E. When directed, just before Substantial Completion, remove dirt and other foreign material and wash and polish glass included in the work on both sides.

END OF SECTION 088100



## SECTION 088117 – FIRE-RATED GLASS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Fire-rated glazing materials installed as vision lights in fire-rated doors.
2. Fire-rated glazing materials installed as sidelites, transoms, and borrowed lites in fire-rated frames.

B. Related Sections include the following:

1. Section 081113 "Hollow Metal Doors and Frames" for vision panels in interior doors and interior vision panel (borrowed lites) frames.
2. Section 081416 "Flush Wood Doors" for vision panels in interior doors.

#### 1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM E 119: Fire Tests of Building Construction and Materials.

B. American National Standards Institute (ANSI):

1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

C. Consumer Product Safety Commission (CPSC):

1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

D. Glass Association of North America (GANA):

1. GANA – Glazing Manual.
2. FGMA – Sealant Manual.

E. National Fire Protection Association (NFPA):

1. NFPA 80: Fire Doors and Windows.

F. Underwriters Laboratories, Inc. (UL):

1. UL 263: Fire tests of Building Construction and Materials

G. Standard Council of Canada:

1. ULC Standard CAN4-S104: Fire Tests of Door Assemblies.
2. ULC Standard CAN4-S106: Fire Tests of Window Assemblies.
3. CAN/ULC-S101M: Standard Methods of Fire Endurance Tests.

H. International Building Code, 2015 Edition.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Fire-rated, clear and wireless glazing material for use in locations such as doors, sidelites, transoms, borrowed lites, and wall applications with fire rating requirements ranging from 45 minutes to 2 hours with required hose stream test; for use in interior and exterior applications.

- B. Provides protection by reducing the radiant and conductive heat transfer

#### 1.4 SUBMITTALS

- A. Comply with requirements of Section 013300.
- B. Product data: Submit manufacturer's technical data for each glazing material required, including installation and maintenance instructions.
- C. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.
- D. Product Test Listings: From UL indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.
- E. Samples: Submit, for verification purposes, approx. 8-inch by 10-inch sample for each type of glass indicated.

#### 1.5 QUALITY ASSURANCE

- A. Glazing Standards: FGMA Glazing Manual and Sealant Manual.
- B. Fire Resistance Rated Glass: Each lite shall bear permanent, nonremovable label of UL certifying it for use in tested and rated fire resistive assemblies.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials under provisions of Section 016000.
- B. Deliver materials to specified destination in manufacturer or distributor's packaging, undamaged, complete with installation instructions.
- C. Pilkington Pyrostop® must not be exposed outside the range -40 degrees F to 120 degrees F (-40-degree C to +50 degrees C) during storage and transportation.
- D. Store off ground, under cover, protected from weather and construction activities.
- E. Do not expose the non-PVB side of glass to UV light.
- F. Store sheets of glass vertically. DO NOT lean.

#### 1.7 WARRANTY

- A. Provide manufacturer's limited warranty under provision of section 016000.

## PART 2 - PRODUCTS

### 2.1 FIRE-RATED GLAZING MATERIALS

- A. Manufacturer: Pilkington Pyrostop® as manufactured by the Pilkington Group and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065, voice 1-800-426-0279, fax 1-800-451-9857, e-mail sales@fireglass.com, Web site www.fireglass.com.
- B. Composition: Composed of multiple sheets of "Optiwhite" high visible light transmission glass laminated with an intumescent interlayer. [Most configurations are available with a translucent interlayer for added obscurity and privacy.]
- C. Properties:
  - 1. Thickness: For Interior Use: 3/4", #45-200, 7/8", #60-101, 1-1/16" #60-201, 1-7/16, #90-102, 2-1/8", #120-104 2-1/4", #120-106 2-13/16", #120-401.
  - 2. Weight: Varies with thickness (approximate range 9 to 22 lbs./sq. ft.).
  - 3. Approximate Visible Transmission: Varies with thickness (approximate range 88 to 75 percent).
  - 4. Fire-rating: Up to 2 hours.
  - 5. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).
  - 6. STC Rating: Up to 46 dB.
  - 7. Exterior Grade: PVB layer on exterior surface.
- D. Permanently label each piece of Pilkington Pyrostop® with the appropriate marking.
- E. Fire Rating – 60 Minutes and Greater: Fire rating classified and labeled by UL for fire rating scheduled at opening locations on drawings, when tested in accordance with ASTM E 119 and UL 263.
- F. Substitutions: No substitutions allowed.

### 2.2 GLAZING COMPOUND FOR FIRE-RATED GLAZING MATERIALS

- A. Glazing Tape: Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air and vapor seal.
- B. Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable. Available Products:
  - 1. Dow Corning 795 - Dow Corning Corp.
  - 2. Silglaze-II 2800 - General Electric Co.
  - 3. Spectrem 2 - Tremco Inc.
- C. Setting Blocks: Hardwood or calcium silicate; glass width by 4 inches by 3/16 inch thick.
- D. Spacers: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness, adhesive-backed on one face only, tested for compatibility with specified glazing compound.
- E. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

## 2.3 FABRICATION

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine glass framing, with glazier present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
  - 2. Minimum required face or edge clearances.
  - 3. Observable edge damage or face imperfections.
- B. Do not proceed with glazing until unsatisfactory conditions have been corrected.
- C. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

### 3.2 INSTALLATION (GLAZING)

- A. Comply with referenced GANA standards and instructions of manufacturers of glass, glazing sealants, and glazing compounds.
- B. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.
- C. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.
- D. Place setting blocks located at quarter points of glass with edge block no more than 6-inches from corners.
- E. Glaze vertically into labeled fire-rated metal frames or partition walls with the same fire rating as glass and push against tape for full contact at perimeter of pane or unit.
- F. Place glazing tape on free perimeter of glazing in same manner described above.
- G. Do not remove protective edge tape.
- H. Install removable stop and secure without displacement of tape.
- I. Do not pressure glaze.
- J. Glaze exterior openings with PVB layer toward the exterior of the building.
- K. Knife trim protruding tape.

- L. Apply cap bead of silicone sealant along void between the stop and the glazing, to uniform line, with bevel to form watershed away from glass. Tool or wipe sealant surface smooth.
- M. Provide minimum 3/16 inch edge clearance.
- N. Install in vision panels in fire-rated doors to requirements of NFPA 80.
- O. Install so that appropriate UL and Pilkington Pyrostop® markings remain permanently visible.

### 3.3 PROTECTION AND CLEANING

- A. Protect glass from contact with contaminating substances resulting from construction operations. Remove any such substances by method approved by glass manufacturer.
- B. Wash glass on both faces not more than four days prior to date scheduled for inspections intended to establish date of substantial completion. Wash glass by method recommended by glass manufacturer.

NOTE: SEE GLAZING SCHEDULE ON FOLLOWING PAGES

3.4 GLAZING SCHEDULE

A. Interior Use:

Fire Rating	Manufacturer Designation	Supply Form	Thickness	Weight Approx.	U-Value	Daylight Trans. Approx. (%)	STC Rating Approx. (dB)	Assembly	Max. Exposed Area (Sq. In.)	Max. Width Of Exposed Glazing (In.)	or	Max. Height Of Exposed Glazing (In.)
45 min.	45-200	Single Glazing	3/4" (19 mm)	9.22 lb / ft <sup>2</sup> (45.00 kg / m <sup>2</sup> )	.86	86	40	Other than doors Door	4,500 3,724	95-1/4 41-5/8		95-1/4 89-3/4
60 min.	60-101	Single Glazing	7/8" (23 mm)	10.86 lb / ft <sup>2</sup> (53.00 kg / m <sup>2</sup> )	.83	87	41	Other than doors Door	5,616 3,724	96 41-5/8		96 89-3/4
60 min.	60-201	Single Glazing	1-1/16" (27 mm)	12.90 lb / ft <sup>2</sup> (63.00 kg / m <sup>2</sup> )	.83	86	44	Other than doors Door	7,442 3,724	96 41-5/8		118-1/4 89-3/4
90 min.	90-102	Single Glazing	1-7/16" (37 mm)	17.61 lb / ft <sup>2</sup> (86.00 kg / m <sup>2</sup> )	.74	84	45	Other than doors Door	3,724 3,724	96 41-5/8		96 89-3/4
2 hr.	120-104	I.G. Units	2-1/8" (54 mm) [with 8 mm spacer, or 2-3/8" (60 mm) with 14 mm spacer]	21.71 lb / ft <sup>2</sup> (106.00 kg / m <sup>2</sup> )	.44	75	46	Other than doors	3,730	111		111
2 hr.	120-106	I.G. Units	2-1/4" (57 mm)	22.94 lb / ft <sup>2</sup> (112.00 kg / m <sup>2</sup> )	.42	75	46	Other than doors	3,730	111		111
2 hr.	120-401	I.G. Units	2-13/16" (72 mm)	30.72 lb / ft <sup>2</sup> (150.00 kg / m <sup>2</sup> )	.46	73	45	Fireframes ClearFloor® System	2,372	47-1/4		50-3/8

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B. Exterior Use:

Fire Rating	Manufacturer Designation	Supply Form	Thickness	Weight Approx.	U-Value	Daylight Trans. Approx. (%)	STC Rating Approx. (dB)	Assembly	Max. Exposed Area (Sq. In.)	Max. Width Of Exposed Glazing (In.)	or	Max. Height Of Exposed Glazing (In.)
45 min.	45-200	Single Glazing	3/4" (19 mm)	9.22 lb / ft <sup>2</sup> (45.00 kg / m <sup>2</sup> )	.86	86	40	Other than doors Doors	4,500 3,724	95-1/4 41-5/8		95-1/4 89-3/4
45 min.	45-260	I.G. Units	1-5/16" (33 mm)	12.29 lb / ft <sup>2</sup> (60.00 kg / m <sup>2</sup> )	.49	77	40	Other than doors Door	4,500 3,724	95-1/4 41-5/8		95-1/4 89-3/4
45 min.	45-360*	I.G. Units	1-5/16" (33 mm)	12.29 lb / ft <sup>2</sup> (60.00 kg / m <sup>2</sup> )	.37- .39	59-71	40	Other than doors Doors	4,500 3,724	95-1/4 41-5/8		95-1/4 89-3/4
60 min.	60-201	Single Glazing	1-1/16" (27 mm)	12.90 lb / ft <sup>2</sup> (63.00 kg / m <sup>2</sup> )	.83	86	44	Other than doors Door	7,442 3,724	96 41-5/8		118-1/8 89-3/4
60 min.	60-261	I.G. Units	1-5/8" (41 mm)	15.98 lb / ft <sup>2</sup> (78.00 kg / m <sup>2</sup> )	.48	77	44	Other than doors Door	7,442 3,724	96 41-5/8		118-1/8 89-3/4
60 min.	60-361*	I.G. Units	1-5/8" (41 mm)	15.98 lb / ft <sup>2</sup> (78.00 kg / m <sup>2</sup> )	.37- .39	59-70	44	Other than doors Door	7,442 3,724	96 41-5/8		118-1/8 89-3/4
90 min. -2 hr.	120-202	Single Glazing	1-9/16 (40 mm)	18.64 lb / ft <sup>2</sup> (91.00 kg / m <sup>2</sup> )	.72	86	46	Door	3,724	41-5/8		89-3/4
90 min. -2 hr.	120-262	I.G. Units	2-3/8" (60 mm) [with 14 mm spacer, or 2-1/8" (54	21.71 lb / ft <sup>2</sup> (106.00 kg / m <sup>2</sup> )	.44	74	46	Other than doors	3,730	111		111

90 min. - 2 hr.	120-362*	I.G. Units	mm) with 8 mm spacer] 2-3/8" (60 mm) [with 14 mm spacer, or 2-1/8" (54 mm) with 8 mm spacer]	21.71 lb / ft2 (106.00 kg / m2)	.35	33-68	46	Other than doors	3,730	111	111
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\*Performance values vary for exterior I.G. units based upon the coating on surface #2. Coatings available are Eclipse Advantage Clear, Solar-E™ Solar Control Low-E and Energy Advantage Low-E. Length/thickness tolerances available upon request.

WHEN PROVIDED PROJECT-SPECIFIC CRITERIA (SUCH AS WIND LOAD, SEISMIC MOVEMENT, STRUCTURAL, AIR/WATER RESISTANCE, ETC.), TGP CAN VERIFY THE INTENDED FENESTRATION CONFIGURATION (GLASS AND FRAMING) WILL PERFORM TO MEET THOSE REQUIREMENTS. FOR APPROVED FRAMING SYSTEMS FOR USE WITH PILKINGTON PYROSTOP, VISIT FIREGLASS.COM OR CALL 800.426.0279.

END OF SECTION 088117

## SECTION 088813 – GLASS - FIRE RESISTANT GLAZING

### PART 1 - GENERAL

#### 1.01 SUMMARY

A. Section Includes:

1. Fire-rated glazing materials installed as borrowed lites in fire-rated frames.

B. Related Sections include the following:

1. Section 081113 "Hollow Metal Doors and Frames" for vision panels in interior doors and interior vision panel (borrowed lites) frames.
2. Section 081416 "Flush Wood Doors" for vision panels in interior doors.

#### 1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM E2010-01: Standard Test Method for Positive Pressure Fire Tests of Window Assemblies.

B. Glass Association of North America (GANA):

1. GANA – Glazing Manual.
2. FGMA – Sealant Manual.

C. National Fire Protection Association (NFPA):

1. NFPA 80: Fire Doors and Windows.
2. NFPA 257 – Fire Tests of Window Assemblies.

D. Underwriters Laboratories, Inc. (UL):

1. UL 9 – Fire Tests of Window Assemblies.

E. 2015 International Building Code.

F. American Society for Testing and Materials (ASTM):

1. ASTM E2074-00: Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies.

G. American National Standards Institute (ANSI):

1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

H. Consumer Product Safety Commission (CPSC):

1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials
- I. Glass Association of North America (GANA):
  1. GANA – Glazing Manual
  2. FGMA – Sealant Manual
- J. National Fire Protection Association (NFPA):
  1. NFPA 80: Fire Doors and Windows
  2. NFPA 252: Fire Tests of Door Assemblies
  3. NFPA 257: Fire Tests of Window Assemblies
- K. Underwriters Laboratories, Inc. (UL):
  1. UL 9 – Fire Tests of Window Assemblies
  2. UL 10B – Fire Tests of Door Assemblies
  3. UL 10c – Positive Pressure Fire Tests of Door Assemblies

#### 1.03 PERFORMANCE REQUIREMENTS

- A. Fire-rated glass ceramic clear and wireless glazing material listed for use in non-impact safety-rated locations such as transoms and borrowed lites with fire rating requirements ranging from 20 to 90 minutes with hose stream test.
- B. Passes positive pressure test standards UBC 7-2 and UBC 7-4.

#### 1.04 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For the following products, in the form of 12-inch square Samples for glass.
  1. Each color of tinted float glass.
  2. Coated vision glass.
- C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Product Test Reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products:

1. FireLite Plus.

G. Warranties: Special warranties specified in this Section.

#### 1.05 QUALITY ASSURANCE

A. Glazing Standards: GAMA Glazing Manual and FGMA Sealant Manual.

B. Fire Protective Rated Glass: Each lite shall bear permanent, nonremovable label of UL certifying it for use in tested and rated fire protective assemblies.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to specified destination in manufacturer's or distributor's packaging, undamaged, complete with installation instructions.

B. Store off ground, under cover, protected from weather and construction activities.

#### 1.07 WARRANTY

A. Technical Glass Products warrants only that the product will be free of manufacturing defects resulting in materials obstruction through the glass area and/or edge separation and changes in properties of the interlayer for a period of five (5) years from the date of purchase, provided the products have been properly shipped, stored, handles, installed, and maintained. The remedy for product proved to be defective under the terms of this warranty is limited to shipment of replacement product. With respect to all claims under this warranty, Technical Glass Products shall have the right to inspect any and all products alleged to be defective.

### PART 2 - PRODUCTS

#### 2.01 FIRE-RATED GLAZING MATERIALS

A. Manufacturer: Basis of Design: FireLite® as manufactured by Nippon Electric Glass Company, Ltd., and distributed by Technical Glass Products, Kirkland, Washington, voice 1-800-426-0279, fax 1-800-451-9857, e-mail sales@fireglass.com, web site www.fireglass.com.

B. Properties:

1. Thickness: 3/16 inch [5 mm].
2. Weight: 2.4 lbs./sq. ft.
3. Approximate Visible Transmission: 88 percent.
4. Approximate Visible Reflection: 9 percent.
5. Hardness (Vicker's Scale): 700.
6. Fire-rating: 20 minutes to 90 minutes.

7. Impact Safety Resistance: None.
  8. Positive Pressure Test: UL 10C, UBC 7-2 and 7-4; passes.
  9. Surface Finish: Premium (polished) [Standard (unpolished)] [Obscure (patterned)].
- C. Maximum sheet sizes based on surface finish:
1. Premium: 48 inches by 96 inches.
  2. Standard: 48 inches by 96 inches.
  3. Obscure: 36 inches by 96 inches.
- D. Labeling: Permanently label each piece of FireLite with the FireLite® logo, UL logo and fire rating in sizes up to 3,325 sq. in., and with the FireLite® label only for sizes that exceed the listing (as approved by the local authority having jurisdiction).
- E. Fire Rating: Fire rating listed and labeled by UL for fire rating scheduled at opening locations on drawings, when tested in accordance with [ASTM E2074-00 and ASTM E2010-01] [ULC Standards CAN4 S-104 and CAN4 S-106] [NFPA 257] [UL 9 and UL 10B].
- F. Substitutions: Architect Approved Equal.

## 2.02 FIRE GLASS 20

- A. Manufacturer: Basis of Design: Fireglass 20 as manufactures by J.R. Four Ltd., and distributed by Technical Glass Products, Kirkland, Washington, voice 1-800-426-0279, fax 1-800-451-9857, e-mail [sales@fireglass.com](mailto:sales@fireglass.com), website [www.fireglass.com](http://www.fireglass.com).
- B. Properties:
1. Thickness: 1/4"
  2. Weight: 3.0 lbs./sq.ft.
  3. Approximate Visible Transmission: 89%
  4. Approximate Visible Reflection: 8%
  5. Fire-rating: 20 minutes ( WITHOUT HOSE STREAM TEST)
  6. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II)
- C. Labeling: Permanently label each piece of fireglass 20 logo, UL logo and fire rating in sizes up to 6,396 SF.
- D. Fire Rating: Fire rating listed and labeled by UL for fire rating scheduled at opening locations on drawings, when tested in accordance with [ASTM E2074-00] [NPFA 252] [UL 9, UL 10B and UL 10C].
- E. Substitutions: Architect Approved Equal.

## 2.03 FABRICATION

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

## 2.4 GLAZING COMPOUND FOR FIRE-RATED GLAZING MATERIALS

- A. Glazing Tape: Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent.
- B. Setting Blocks: Neoprene, EDPM or hardwood; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness.
- C. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine glass framing, with glazier present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
  - 2. Minimum required face or edge clearances.
  - 3. Observable edge damage or face imperfections.
- B. Do not proceed with glazing until unsatisfactory conditions have been corrected.
- C. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

### 3.02 INSTALLATION (GLAZING)

- A. Comply with referenced FGMA standards and instructions of manufacturers of glass, glazing sealants, and glazing compounds.
- B. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.
- C. Set units of glass in each series with uniformity of pattern, draw, bow, and similar characteristics.
- D. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.
- E. Place setting blocks located at quarter points of glass with edge block no more than 6 inches from corners.

- F. Glaze vertically into labeled fire-rated metal frames or partition walls with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.
- G. Place glazing tape on free perimeter of glazing in same manner described above.
- H. Install removable stop and secure without displacement of tape.
- I. [Use specified glazing compound, without adulteration; bed glazing material in glazing compound; entirely fill all recess and spaces. Provide visible glazing compound with smooth and straight edges.]
- J. Install so that appropriate [UL] [FireLite®] markings remain permanently visible.

3.03 PROTECTION AND CLEANING

- A. Protect glass from contact with contaminating substances resulting from construction operations. Remove any such substances by method approved by glass manufacturer.
- B. Wash glass on both faces not more than four days prior to date scheduled for inspections intended to establish date of substantial completion. Wash glass by method recommended by glass manufacturer.

3.04 GLAZING SCHEDULE – FIRELITE

Rating	Assembly	Max. Exposed Area (Sq. In.)	Max. Width	OR	Max. Height	Stop Height
			Of Exposed Glazing (In.)		Of Exposed Glazing (In.)	
20 to						
60 min.	HMS or wood*	3,325	95		95	5/8"
	Fireframes D.S.	3,325	95		95	3/4"
90 min.						
	Other than doors	2,627	56 1/2"		56 1/2"	5/8"
	HMS	2,627	56 1/2"		56 1/2"	3/4"
	Fireframes D.S.					

- HMS indicates hollow metal steel framing. Fireframes D.S. indicates Designer Series narrow profile framing available from TGP. For wood frames, check with manufacturer for maximum tested glass sizes.

3.5 GLAZING SCHEDULE – FIRE GLASS 20

Rating	Assembly	Max. Exposed Area (Sq. In.)	Max. Width Of Exposed Glazing (In.)	OR	Max. Height Of Exposed Glazing (In.)	Stop Height
20 min.	Doors	3,204	36		89	5/8"
[w/o hose stream test]	Other than doors	6,396	106-1/2		106-1/2	5/8"

END OF SECTION 088813



## SECTION 089000 – LOUVERS AND VENTS

### 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, extruded-aluminum louvers.

#### 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 axes of the blades are horizontal.
- C. Drainable-Blade Louver: 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.

#### 1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
  - 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.
  - 3. Wiring Diagrams: For power, signal, and control wiring for motorized adjustable louvers.

#### 1.05 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.
- B. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
  - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."

3. AWS D1.6, "Structural Welding Code - Stainless Steel."
- C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.
- D. UL and NEMA Compliance: Provide motors and related components for motor-operated louvers that are listed and labeled by UL and comply with applicable NEMA standards.

#### 1.06 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.
- B. Fasteners: Use types and sizes to suit unit installation conditions.
  1. Use hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.
  2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
- 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 per ASTM E 488, conducted by a qualified independent testing agency.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

#### 2.02 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing to produce uniform appearance.
- C. 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.
- D. Include supports, anchorages, and accessories required for complete assembly.
- E. Provide extended sills for recessed louvers.

#### 2.03 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal, Drainable-Blade Louver:

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. Arrow United Industries; a division of Mestek, Inc.
  - b. Carnes Company, Inc.
  - c. Greenheck Fan Corporation.
  - d. Louvers & Dampers, Inc.; a division of Mestek, Inc.
  - e. Ruskin Company; Tomkins PLC.
  - f. United Enertech Corp.
2. Louver Depth: 4 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.081 inch for blades and 0.081 inch for frames.
4. Mullion Type: Exposed.
5. Louver Performance Ratings:
  - a. Free Area: Not less than 54% for 48-inch- wide by 48-inch- high louver.
  - b. Point of Beginning Water Penetration: Not less than 870 fpm.
6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

#### 2.04 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
  1. Screen Location for Fixed Louvers: Interior face.
- B. Secure screen frames to louver frames with machine screws with heads finished to match louver, 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 kind and form of metal as indicated for louver to which screens are attached.
  2. Finish: Same finish as louver frames to which louver screens are attached.
- D. Louver Screening for Aluminum Louvers:
  1. Bird Screening: Flattened, expanded aluminum, 5/8 by 0.040 inch thick.

#### 2.05 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

### 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.

- B. 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 and vents 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. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- F. Protect unpainted galvanized and nonferrous-metal surfaces that will be 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.
- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required.

### 3.04 ADJUSTING AND CLEANING

- A. Clean exposed surfaces of louvers and vents 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 and vents 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 089000

## SECTION 090561 – WATER VAPOR EMISSION CONTROL SYSTEM FOR CONCRETE SLABS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Testing and application of systems for the reduction of moisture vapor transmission and alkalinity control for interior concrete slabs scheduled for floor finish of VCT, vinyl flooring, rubber flooring, wood, carpet, and/or epoxy flooring systems.

#### 1.2 RELATED SECTIONS

- A. Section 033000 - Cast-In Place Concrete: Installation and curing requirements according to ACI 302.
- B. Section 096513 – Resilient Base and Accessories
- C. Section 096520 – Tile Flooring Including Vinyl Enhanced Tile

#### 1.3 REFERENCES

- A. American Society of Testing and Materials (ASTM):
  - 1. C 109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
  - 2. C 348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
  - 3. D 1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
  - 4. E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
  - 5. F 1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Floor Using Anhydrous Calcium Chloride.
  - 6. F 2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- B. International Concrete Repair Institute (ICRI) Guideline No. 03732 - Selecting and Specifying Concrete; Surface Preparation for Sealers, Coatings and Polymer Overlays.

#### 1.4 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Manufacturer's specification.

2. Installation instructions.
  3. Independent test data.
  4. Certification requirements.
  5. Warranty information.
- C. Pre-Construction Testing: Submit anhydrous calcium chloride test results. Test shall be performed according to ASTM F 1869. Test shall be performed by the General Contractor and submitted to the Architect, and manufacture's site representative.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

## 1.5 QUALITY ASSURANCE

### A. Manufacturer Qualifications:

1. Manufacturer shall have no less than five years experience in manufacturing water vapor reduction systems. The water vapor reduction system shall be specifically formulated and marketed for water vapor reduction and alkalinity control. System design shall provide protection from vapor emission rates less than or equal to 20 pounds per 1000 square feet per 24 hours and/or 98% relative humidity.

### B. Installer Qualifications:

1. Applicator shall be approved by the manufacturer, experienced in surface preparation and application of the material and shall be subject to inspection and control by the manufacturer.
2. Installer shall have no less than five years experience installing the specified fluid based coating systems.

### C. Product Performance History:

1. Manufacturer shall provide independent lab test reports documenting performance per the following:
  - a. ASTM E 96, Water Vapor Transmission (wet methods) Performance shall be documented by an independent testing laboratory indicating a minimum of 90 percent water vapor transmission reduction compared to untreated concrete.
  - b. ASTM D 1308; Insensitivity to alkaline environment up to pH 14.
  - c. Certify acceptance and exposure to continuous topical water contact after final cure.
2. Submit list of product use and performance history, for the same formulation and system design, listing reference sources. Similar projects shall have documented minimum initial water vapor transmission rates of 20 lb per 1000 sf per 24 hours to 3 lb per 1000 sf per 24 hours, and have resulted in maintained water vapor reduction rate of less than 3 lb per 1000 sf per 24 hours when tested according to ASTM F1869.

- D. Mock-up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Finish areas designated by Architect.
  - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
  - 3. Refinish mock-up area as required to produce acceptable work.

#### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to the job site in their original unopened containers, clearly labeled with the manufacturer's name and brand designation.
- B. Store products in an approved ventilated dry area; protect from dampness, freezing, and direct sun light. Product should not be stored in areas with temperatures in excess of 90 degrees F (32 degrees C) or below 50 degrees F (10 degrees C).
- C. Handle product in a manner that will prevent breakage of containers and damage products.

#### 1.7 PROJECT CONDITIONS

- A. Select a floor covering system scheduled for the treated concrete substrate having the ability to withstand water vapor transmission levels up to 3 lb per 1000 sf (1.5 kg/100 sq. m) /24 hours.
- B. 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.
  - 1. Do not apply moisture vapor reduction system to unprotected surfaces or when water is accumulated on the surface of the concrete.
  - 2. Do not apply water vapor reduction system when temperature is lower than 50 degrees F (10 degrees C) or expected to fall below this temperature within 24 hours from time of application.
  - 3. Allow continuous ventilation and indirect air movement at all times during application and curing process of the water vapor reduction system.
  - 4. Protection: Protect water vapor reduction system to prevent damage from active rain or surface water for a minimum of 24 hours from time of application.

#### 1.8 SCHEDULING

- A. Before installation of VCT, sheet vinyl, rubber flooring, wood, carpet and/or epoxy flooring systems over the interior concrete slabs, anhydrous calcium chloride testing shall be performed per ASTM F 1869 or ASTM F 2170 by the General Contractor to determine the level of water vapor transmission or relative humidity in the slab and the application rate of the moisture vapor reduction system required.
- B. The General Contractor will coordinate the scheduling of the water vapor reduction

system testing, allowing adequate time to test, review results and determine the water vapor reduction system application rate before installation of floor finish is required.

- C. The General Contractor will allow a reasonable period of time (Minimum of 3 days) for the concrete slab to cure and dry before performing anhydrous calcium chloride tests. All mastics, glues, curing compounds and contaminants shall be removed to provide a clean, sound, concrete substrate prior to performing anhydrous calcium chloride tests.

## 1.9 WARRANTY

- A. Manufacturer shall provide the Owner with a system warranty including adhesives and surface preparation products for a period of no less than ten years at no additional cost.
- B. Installer of water vapor reduction system shall provide standard installation warranty for workmanship.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis of Design Manufacturer: CHAPCO / H.B. Fuller Construction Products Inc.: 1105 S. Frontenac Street, Aurora, IL 60504, email: [charlie.renner@hbfuller.com](mailto:charlie.renner@hbfuller.com), web: <http://chapco-adhesive.com>
- B. Substitutions: As approved by Architect.

### 2.2 SYSTEM

- A. Single Coat System: 2-component, VOC Compliant, Low viscosity, 100 percent solid epoxy formulated as a vapor barrier against high moisture and alkalinity in concrete substrates. The water vapor reduction system shall, after final cure, reduce vapor emissions from a maximum of 98 percent relative humidity and alkalinity reduction to acceptable pH levels.
  - 1. Product: CHAPCO'S DEFENDER as manufactured by CHAPCO / H.B. Fuller Construction Products, Aurora, IL.
  - 2. A Single Coat System consists of one coat of CHAPCO'S DEFENDER coating to be applied to a properly prepared concrete surface at an application rate determined by an anhydrous calcium chloride tests or RH in situ probes.
  - 3. Mix Component A and B at a ratio per manufacturers strict instructions.

## PART 3 EXECUTION

### 3.1 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.

### 3.2 PREPARATION

- A. Inspect surfaces with manufacturer's representative to determine its suitability to receive the moisture vapor reduction system. Provide an uncontaminated, sound surface.
- B. Clean surfaces to receive moisture vapor reduction system. Shot blast floors and clean surfaces to remove residue from the substrate. Remove defective materials, and foreign matter such as dust, adhesives, leveling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, shot blast abrasive residue, etc.
- C. Repair cracks, expansion joint, control Joints, and open surface honeycombs.
  - 1. Use CHAPCO'S DEFENDER mixed 1:1 by volume with clean, white fine silica sand. Force mixture into cracks and joints with a trowel or putty knife. Comply with requirements listed in manufacturer's technical data information. No exceptions. Consult with vapor reduction manufacturer.
- D. Verify that surfaces to be treated with moisture vapor reduction system have not previously been treated with materials such as underlayments, screeds, penetrating sealants, etc.
  - 1. Consult with vapor reduction system manufacturer prior to application.
- E. Verify if concrete additives such as chlorides or other soluble compounds that may contaminate surfaces have been used in the concrete mix.
  - 1. Consult with vapor reduction system manufacturer prior to application.
- F. Do not acid etch surface.
- G. Verify that the substrate surface does not deteriorate due to the presence of sulphurous compounds or alkaline aggregate/silica reaction encountered in certain areas.
  - 1. Consult with vapor reduction system manufacturer prior to application.
  - 2. Testing for concrete deficiencies / contamination such as alkaline silica reaction, untreated silicates, organic residue, etc. is the responsibility of the General Contractor.
- H. The surface substrate shall remain uncontaminated, absorptive, and sound prior to receiving a water vapor reduction system. Comply with all requirements as listed in manufacturer's technical data information. No exceptions.

### 3.3 APPLICATION

- A. Single Coat System Application:
  - 1. The coverage rates for the Single Coat System are dependant on the surface texture and porosity of the substrate.
  - 2. Required Application Rate Relative to Existing Levels of Moisture Vapor to Achieve 3 lb/1000 sf / 24 hours Moisture Levels:
    - a. Up to 20 lb/1000 sf / 24 hr: 130-180 s / gallon.
  - 3. Apply one coat of CHAPCO'S DEFENDER™ Moisture Vapor Barrier using a

squeegee. Allow 5 minutes for surface to "off gas". Back roll CHAPCO'S DEFENDER with a 3/8 inch (9.5 mm) nap roller to achieve uniform, continuous application of membrane. Allow the minimum cure time before installing the finish flooring.

### 3.4 TESTING

#### A. Initial Tests:

1. Anhydrous calcium chloride testing shall be performed by the installer.
2. Provide initial anhydrous calcium chloride tests according ASTM F 1869 to the prepared concrete surfaces. Tests shall be performed on properly prepared concrete. No exceptions!
3. Conduct calcium chloride tests at the same temperature and humidity as designed normal occupancy. If this is not possible, test conditions shall be 75 degrees F +/-10 degrees (24 degree C +/- 5 degrees) and 50 percent +/-10 percent relative humidity. Maintain these conditions 48 hours prior to and during tests. Water vapor transmission levels are directly affected by ambient room temperature and readings conducted without a sustained ambient temperature are not acceptable.
4. Installer shall provide test results with a marked up floor finish plan showing test results. General Contractor shall provide a written clarification on status of the ambient air temperature and humidity before and during the testing procedures.
5. Installer shall provide a marked up floor plan showing areas with vapor reduction system recommendations.

#### B. Post-Treatment / Pre-Flooring Tests:

1. Before installation of VCT, sheet vinyl, rubber flooring, wood, carpet, and / or epoxy flooring systems and after proper cure of the final coat of the water vapor reduction system provide anhydrous calcium chloride tests according ASTM F 1869. Allow the vapor mitigation system to cure 72 hours before performing test. Water vapor transmission and alkalinity tests shall be performed on properly treated concrete. No exceptions!
2. The installer shall provide test results of the level of water vapor transmission and alkalinity of the concrete slab to all parties involved. The flooring manufacturer and installer shall accept the floor condition and certify that the flooring application materials and methods are compatible with the test results and floor condition.

#### C. Adhesion

1. The flooring installer shall verify the usage of CHAPCO Multipurpose Primer prior to the installation of any patches or floor prep materials. Non permeable flooring systems require the application of a cementitious skim coat, such as CHAPCO SmoothFinish™, entirely covering CHAPCO'S DEFENDER and Multipurpose Primer prior to the installation of Floor Covering.

### 3.5 CLEANING

- #### A. Remove all debris resulting from water vapor reduction system installation from project

site.

3.6 PROTECTION

- A. Protect each coat during specified cure period from any kind of traffic, topical water and contaminants.

END OF SECTION 090561



## SECTION 092900 – GYPSUM BOARD

### 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. Exterior gypsum board for ceilings and soffits.
- B. Related Requirements:
  - 1. Section 061000 "Rough Carpentry"

#### 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
  - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.
  - 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

#### 1.04 QUALITY ASSURANCE

- A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Install mockups for the following:
    - a. Each level of gypsum board finish indicated for use in exposed locations.
    - b. Each texture finish indicated.
  - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
  - 3. Simulate finished lighting conditions for review of mockups.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.05 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.

## 1.06 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 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.
  - 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. Moisture- and Mold-Resistant Assemblies: Provide and install moisture- and mold-resistant glass-mat gypsum wallboard products with moisture-resistant surfaces complying with ASTM C 1658 and ASTM C 1177 where indicated on Drawings and in all locations which might be subject to moisture exposure during construction. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- D. Low-Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying 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."

### 2.02 GYPSUM BOARD, GENERAL

- A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.
- B. 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. Basis-of-Design Product: The design for each type of gypsum board and related products is based on Georgia-Pacific Gypsum products named. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. American Gypsum.
  2. CertainTeed Corp.
  3. Lafarge North America Inc.
  4. National Gypsum Company.
  5. PABCO Gypsum.
  6. Temple-Inland.
  7. USG Corporation.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
1. Basis-of-Design Product: Georgia-Pacific Gypsum; DensArmor Plus High-Performance Interior Panel.
  2. Thickness: 1/2 inch.
  3. Long Edges: Tapered.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
1. Basis-of-Design Product: Georgia-Pacific Gypsum; DensArmor Plus Fireguard High-Performance Interior Panel.
  2. Thickness: 5/8 inch.
  3. Long Edges: Tapered.
- D. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M.
1. Basis-of-Design Product: Georgia-Pacific Gypsum; DensArmor Plus Abuse-Resistant Panel
  2. Thickness: 5/8 inch.
  3. Long Edges: Tapered.
- E. Impact-Resistant Gypsum Board: ASTM C 1629/C 1629M.
1. Basis-of-Design Product: Georgia-Pacific Gypsum; DensArmor Plus Impact-Resistant Panel.
  2. Thickness: 5/8 inch.
  3. Long Edges: Tapered.
  4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

## 2.04 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
  2. Shapes:
    - a. Cornerbead.

- b. Bullnose bead.
  - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
  - d. L-Bead: L-shaped; exposed long flange receives joint compound.
  - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
  - f. Expansion (control) joint.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
- 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. Fry Reglet Corp.
    - b. Gordon, Inc.
    - c. Pittcon Industries.
  - 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
  - 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

## 2.05 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
- 1. Interior Gypsum Board: Paper.
  - 2. Exterior Gypsum Soffit Board: Paper.
  - 3. Exterior Glass Mat Gypsum Soffit: Fiberglass mesh.
  - 4. Glass-Mat Gypsum Wallboard: 10-by-10 fiberglass mesh.
  - 5. Glass-Mat Gypsum Sheathing Board: 10-by-10 fiberglass mesh.
  - 6. 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. Prefilling: At open joints rounded or beveled panel edges and damaged surface areas, use setting-type taping compound.
    - a. Basis-of-Design Product: Georgia-Pacific Gypsum; ToughRock Setting Compound or ToughRock Sandable Setting Compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping or drying-type, all-purpose compound.
    - a. Basis-of-Design Product: Georgia-Pacific Gypsum; ToughRock Setting Compound, ToughRock Sandable Setting Compound, ToughRock Ready Mix All-Purpose Joint Compound.
    - b. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose compound.
  - a. Basis-of-Design Product: Georgia-Pacific Gypsum; ToughRock Setting Compound, ToughRock Sandable Setting Compound, ToughRock Ready Mix All-Purpose Joint Compound, ToughRock Ready Mix Topping Joint Compound.
4. Finish Coat: For third coat, use setting-type, sandable topping or drying-type, all-purpose compound.
  - a. Basis-of-Design Product: Georgia-Pacific Gypsum; ToughRock Setting Compound, ToughRock Sandable Setting Compound, ToughRock Ready Mix All-Purpose Joint Compound, ToughRock Ready Mix Topping Joint Compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound, drying-type, all-purpose compound, high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
  - a. Basis-of-Design Product: Georgia-Pacific Gypsum; ToughRock Setting Compound, ToughRock Sandable Setting Compound, ToughRock Ready Mix All-Purpose Joint Compound, ToughRock Ready Mix Topping Joint Compound.

## 2.06 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
  1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Laminating adhesive 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."
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
  1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
  2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
  2. Recycled Content of Blankets: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.
- E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
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. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
    - e. USG Corporation; SHEETROCK Acoustical Sealant.
  2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  3. Acoustical joint sealant 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."

## 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 C 840.
- 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 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. 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- 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- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

### 3.03 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Wallboard Type: As indicated on Drawings.
  - 2. Type X: As indicated on Drawings.
  - 3. Abuse-Resistant Type: As indicated on Drawings.
  - 4. Impact-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 vertically (parallel 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. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
  4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying 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 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. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
  4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

### 3.04 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 C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
  1. Cornerbead: Use at outside corners unless otherwise indicated.
  2. Bullnose Bead: Use at outside corners.

3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated.
5. U-Bead: Use at exposed panel edges.

### 3.05 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. Prefill 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 C 840:
  1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  2. Level 2: Panels that are substrate for tile.
  3. Level 3: Where indicated on Drawings.
  4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
  5. Level 5: Where indicated on Drawings.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

### 3.06 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900



## SECTION 09 51 10 – ACOUSTIC CEILINGS

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract apply to this section. This includes General and Supplementary Conditions of Division 01 (1) Specification Sections.

#### 1.2 SUMMARY

- A. Section includes acoustic panels and suspension systems for ceilings
- B. Related Sections
  - 1. Division 26 – Electrical

#### 1.3 REFERENCES

- A. ASTM A641 – *Specification for Steel Sheet, Zinc-Coated (galvanized) Carbon Steel Wire*
- B. ASTM A653 – *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galv-annealed) by the Hot-Dip Process*
- C. ASTM C423 – *Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method*
- D. ASTM C635 – *Standard Specification for Metal Suspension Systems for Acoustic Tile and Lay-in Panel Ceilings*
- E. ASTM C636 – *Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings*
- F. ASTM D6866 – *Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis*
- G. ASTM E84 – *Test Method for Surface Burning Characteristics of Building Materials*
- H. ASTM E580 – *Practice for Application of Ceiling Suspension Systems for Acoustic Tile and Lay-in Panels in Areas Requiring Seismic Restraint*
- I. ASTM E795 – *Practice for Mounting Test Specimens During Sound Absorption Tests*
- J. ASTM E1111 – *Test Method for Measuring Interzone Attenuation of Ceiling Systems*
- K. ASTM E1264 – *Classification for Acoustic Ceiling Products*
- L. ASTM E1414 – *Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum*
- M. ASTM E1477 – *Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating Sphere Reflectometer*
- N. CAN/ULC-S102 – *Method of Test for Surface Burning Characteristics of Building Materials and Assemblies*
- O. ISO 14024 *Environmental Labels and Declarations - Type I Environmental Labeling - Principles and Procedures*
- P. ISO 14025 - *Environmental Labels and Declarations -- Type III Environmental Declarations -- Principles and Procedures*
- Q. ISO 14644 – *Classification of Air Cleanliness*
- R. CISCA (Ceilings & Interior Systems Construction Association) – *Ceilings Systems Handbook*
- S. CISCA (Ceilings & Interior Systems Construction Association) – *Acoustical Ceilings – Use and Practice*
- T. CISCA (Ceilings & Interior Systems Construction Association) – *Guidelines For Seismic Restraint Direct Hung Suspended Ceiling Assemblies*
- U. Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2
  - a. California Dept. of Public Health CDPH/EHLB/Standard Method v1.2, 2017
- V. Health Product Declaration Standard v2.0 – [hpdcollaborative.org](http://hpdcollaborative.org)

#### 1.4 SUBMITTALS

- A. Product Data
  - 1. Submit manufacturer's published technical information for each product
- B. Shop Drawings
  - 1. Submit reflected ceiling plans drawn to scale prescribed by Architect
    - a. Include ceiling suspension assembly members
    - b. Include coordinated penetrations and ceiling-mounted items
    - c. Include any necessary details or drawings from the manufacturer regarding recommended installation
    - d. Method of attaching hangers to building structure.
    - e. Size and location of initial access modules for acoustical tile.
    - f. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- C. Samples
  - 1. Submit representative manufacturer's sample of each panel indicated
  - 2. Submit representative manufacturer's sample of each suspension member indicated
- D. Certifications
  - 1. Provide manufacturer's written certification that products submitted meet or exceed all specified requirements
  - 2. Provide laboratory reports that certify compliance with specified tests
  - 3. Provide third party verified life cycle information with published environmental product declaration (EPD)
    - a. Per ISO 14025 *Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures*

#### 1.5 QUALITY ASSURANCE

- A. Source Limitations
  - 1. Acoustic Ceiling Panel
    - a. Obtain each type through one source from a single manufacturer
  - 2. Suspension System
    - a. Obtain each type through one source from a single manufacturer
- B. Installer Qualifications
  - 1. Must be experienced in the installation of systems similar to those specified herein
- C. Surface Burning Characteristics
  - 1. ASTM E1264
    - a. Class A
  - 2. ASTM E84 United States
    - a. Flame spread of 25 or less
    - b. Smoke developed of 50 or less

#### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery of acoustic ceiling products will be in the original unopened packages with the manufacturer's label intact
- B. Handling and storage should be in accordance with the manufacturer's Material Safety Data Sheets (MSDS)
- C. Individual panels should be handled carefully to avoid damage

#### 1.7 PROJECT CONDITIONS

- A. Environmental Limitations
  - 1. Install acoustic panels only in conditions that are within the manufacturer's published limits for temperature and humidity
  - 2. Areas receiving ceiling panels should be free of construction debris and dust
  - 3. Electrical work above the ceiling shall be completed prior to commencement of the ceiling panel installation

## 1.8 COORDINATION

- A. Coordinate the installation of the acoustic ceiling system with any and all trades whose work is impacted by that installation

## 1.9 EXTRA MATERIALS

- A. Provide extra materials in the manufacturer's unopened packaging, with the manufacturer's label intact, as detailed below
  - 1. Acoustic Panels – Minimum 5% of each type installed
  - 2. Suspension System Components – Minimum 5% of each type installed

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

- A. CertainTeed Ceilings
  - 1. Address: 20 Moores Road, Malvern, PA 19355
  - 2. Telephone: 800-233-8990
  - 3. Web: [www.certainteed.com](http://www.certainteed.com)

### 2.2 ACOUSTIC CEILING UNITS

- A. Acoustical Ceiling Panel (ACP) – Type "CT-1"
  - 1. Basis-of-Design Product Name: Fine Fissured High NRC (HHF-457 HNRC)
  - 2. Physical Characteristics
    - a. Type: III (per ASTM E1264)
    - b. Form: 2 (per ASTM E1264)
    - c. Pattern: C, D (per ASTM E1264)
    - d. Size: 2'x2
    - e. Thickness: 3/4"
    - f. Edges: Trim square edge**
    - g. Finished Surface: Painted
      - 1) Mold / Mildew inhibitor: BioShield
    - h. Finished Surface Color: White
    - i. Core Composition: Wet-felted mineral fiber
    - j. Recycled Content:
      - 1) Fine Fissured High NRC: 70%
        - 1. 68% (pre-consumer)
        - 2. 2% (post-consumer)
  - 3. Performance Criteria
    - a. Noise Reduction Coefficient (NRC) per ASTM C423 (E-400 mounting)
      - 1) 0.70
    - b. Light Reflectance (LR) per ASTM E1477
      - 1) 0.83

- c. Ceiling Attenuation Class (CAC) per ASTM E1414
  - 1) 35
- d. Humidity Resistance
  - 1) Warranted to withstand relative humidity of up to 90% at 104°F without sagging, warping or delaminating for 10-years
- e. Flame Spread Classification per ASTM E84, CAN/ULC-S102: Class A
- 4. Independent Environmental Certifications
  - a. VOC content
    - 1) Third-party certification of compliance
      - 1. Per California Dept. of Public Health *CDPH/EHLB/Standard Method v1.2, 2017*
  - b. Recycled content
    - 1) Third-party verified Type I Environmental Label
      - 1. Per ISO 14024 *Environmental Labels and Declarations - Type I Environmental Labeling - Principles and Procedures*
  - c. Environmental Product Declaration
    - 1) Third-party verified Type III Environmental Product Declaration
      - 1. Per ISO 14025 - *Environmental Labels and Declarations - Type III Environmental Declarations -- Principles and Procedures*
  - d. USDA Certified Biobased Product – 98%
  - e. Health Product Declaration
    - 1) Per Health Product Declaration Standard v2.0
      - 1. [hpdcollaborative.org](http://hpdcollaborative.org)

## 2.3 SUSPENSION SYSTEM

- A. Manufacturer: CertainTeed Ceilings
- B. Components: Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
  - 1. Structural Classification: ASTM C 635 Intermediate Duty
  - 2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
- B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least three times design load, but not less than 12 gauge.
- D. Basis of Design Product: Reveal Beveled 15/16" Exposed Tee as manufactured by CertainTeed
- E. Or Equal Products by the following:
  - 1. Armstrong World Industries
  - 2. Chicago Metallic Corporation.
  - 3. Fry Reglet Corporation.
  - 4. Gordon, Inc.
  - 5. MM Systems, Inc.
  - 6. USG Interiors, Inc.

## F. METAL EDGE MOLDINGS AND TRIM

1. 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 fit acoustical tile edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
  - a. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
2. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with the following requirements:
3.
  - a. Revise subparagraphs below to suit Project and products selected; complement by showing profiles on Drawings. Describe products here and insert names of manufacturers or products in Part 2 "Manufacturers" Article.
4. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.
  - a. Organic Coating: Thermosetting, enamel primer/topcoat system with a minimum dry film thickness of 0.8 to 1.2 mils.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Ascertain acceptability of substrates and building conditions under which the ceiling system is to be installed. Do not proceed with the installation until any and all unacceptable conditions have been rectified.

### 3.2 PREPARATION

- A. Unless otherwise directed by the reflected ceiling plan, measure the space in which the ceiling system is to be installed and establish a layout that balances border widths at opposite ends of the ceiling.
- B. When possible, coordinate the ceiling system layout to avoid the use of less than half width panels at the perimeter.

### 3.3 INSTALLATION

- A. Install the ceiling system in accordance with the following:
  1. Manufacturer's printed instructions
    - a. Available online at [www.certainteed.com/commercial-ceilings](http://www.certainteed.com/commercial-ceilings)
  2. ASTM C636
  3. Ceilings & Interior Systems Construction Association (CISCA) recommendations
  4. Applicable local code requirements
  5. Approved shop drawings

### 3.4 MAINTENANCE

- A. Replace any and all damaged ceiling system components.
- B. Clean any and all exposed surfaces in accordance with the manufacturer's printed instructions.

END OF SECTION 095110

## SECTION 09 65 10 – RUBBER FLOORING

### PART 1 – GENERAL INFORMATION

#### 1.01 SUMMARY

- A. This section deals with resilient flooring found in the drawings and schedules of the contract that meet the requirements of this section.

#### 1.02 RELATED SECTIONS

- A. Section 035400 – Concrete Underlayment Patch
- B. Section 035416 – Cement-Based, Interior Self-Leveling Underlayment
- C. Section 090561 – Water Vapor Emission Control System for Concrete Slabs

#### 1.03 REFERENCES (INDUSTRY STANDARDS)

- A. ASTM F 710: Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- B. ASTM E 648: Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
- C. ASTM E 662: Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
- D. ASTM F 1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- E. ASTM F 2170: Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.

#### 1.04 ITEMS TO DELIVER

- A. Provide the product's Technical Specifications data sheet as well as all Installation and Maintenance Instructions.
- B. When required, supply floor drawings and installation plans.
- C. Supply a set of samples measuring at least 7.5 cm (3 in.) by 15 cm (6 in.) of the complete range of colors and finishes chosen for the project.
- D. When required, provide American Biltrite's attestation, certified by an independent laboratory, confirming that the flooring complies with the fire standards of the following tests:
  - 1. ASTM E 648; Critical Radiant Flux: 0.45 watts/cm<sup>2</sup> or more;
  - 2. ASTM E 662; Smoke Density: 450 or less.
- E. Provide American Biltrite's Warranty Certificate.

#### 1.05 QUALITY ASSURANCE

- A. Have American Biltrite flooring installed by a qualified installer of this type of flooring.
- B. In accordance with the technical instructions in the Installation Instructions, use all the accessories recommended by American Biltrite when installing its flooring.
- C. Follow the instructions specified in the most recent version of American Biltrite's Installation Instructions.

## 1.06 DELIVERY, HANDLING, STORAGE

- A. Deliver the flooring to the installation site in American Biltrite's original packaging. Indicate the project name and handling instructions on the outside of the boxes.
- B. Advise the carrier of any damaged material and indicate it on the packing slip.
- C. Store the flooring inside, sheltered from extreme hot or cold temperatures. Place the material on a smooth level floor or where there is uniform solid support in a clean, dry well-ventilated area. Unstack the palettes. The long-term storage temperature must be maintained between 18°C (65°F) and 24°C (75°F). Protect adhesive and flooring material from freezing, extreme heat and direct sun exposure.
- D. Acclimatize the subfloor, all flooring material and adhesive for 48 hours before, during and after the installation by maintaining the room temperature between 18°C (65°F) and 24°C (75°F). The palettes should be unstacked 24 hours prior to use.
- E. Afterwards, maintain the room temperature between 18°C (65°F) and 29°C (85°F). Protect the material from direct sources of heat such as air vents and other types of heaters.
- F. Install the flooring after all other finishing work, including painting, have been completed.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURER

- A. American Biltrite  
200 Bank Street  
Sherbrooke, QC, Canada, J1H 4K3  
Telephone: 819-829-3300  
Toll free: 1-800-437-8743  
Internet: [www.american-biltrite.com](http://www.american-biltrite.com)

### 2.02 RESILIENT FLOORING DESCRIPTION

- A. Characteristics:
  1. Marathon rubber flooring.
  2. Nominal thickness: 3.0 mm
  3. Sizes:
    - 35-11/16 in. x 35-11/16 in.
  4. Complies with ASTM F 1344, Class I, A or B.
  5. Marathon rubber flooring is not recommended for environments where it could be exposed to oils and greases, whether mineral, animal or vegetable.
  6. Refer to the product's Technical Specifications data sheet for detailed specifications.
  7. Choose from any of American Biltrite's complete line of colors (indicate the item number). Refer to color selections provided on the floor finish schedule
  8. Marathon has FloorScore certification.
  9. This product was manufactured in a factory that has ISO 9001 and ISO 14001 certifications.

### 2.03 ADHESIVES

- A. Either use American Biltrite's AD-777 or AD-535 adhesive. AD-777 and AD-535 both cover 18.6 sq. m/3.8 litres (200 sq. ft. /gallon) when applied with the recommended notched trowel.

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## 2.04 OTHER MATERIAL

- A. Subfloor repairs: use a good-quality Portland cement-based compound modified with latex that has a minimal resistance to compression of 246 kg/cm<sup>2</sup> (3,500 lbs/sq. in.) to fill, smooth or level subfloor imperfections.
- B. Self-levelling underlayment: use a Portland cement-based self-levelling underlayment modified with a polymer that has a minimal resistance to compression of 246 kg/cm<sup>2</sup> (3,500 lbs/sq. in.).

## PART 3 – EXECUTION

### 3.01 SITE INSPECTION

- A. Examine the subfloor before installation to ensure that the surface is clean, dry, smooth, structurally sound and free from foreign substances that may adversely affect adhesion or cause discoloration. Furthermore, ensure that the subfloor is free of paint, varnish, adhesive, oil, grease, solvent and other foreign substances, including treatment compounds and demolding products, sealers and curing compounds that may adversely affect adhesion or alter the appearance or durability of the vinyl flooring.
- B. Verify the surface to ensure there is no powder, scaling or mold. If there is, remove it with a mechanical sander and level with a good-quality cement-based Portland primer.
- C. Slabs that have been either using a curing agent or a sealer will have to be treated to insure that the adhesion has not been impaired.
- D. Do not install on cement slabs that have been subjected to adhesive chemical abatement, unless an approved remediation system was used afterwards.
- E. Report and rectify all unsatisfactory conditions. Do not start flooring installation until all rectifications have been completed.

### 3.02 SUBFLOOR PREPARATION

- A. Level all rough surfaces and fill cracks and marks with a Portland cement-based patching compound modified with latex.
- B. Mechanically remove all surface contaminants such as paint, oil, grease, varnish, adhesive as well as various other products such as treatment compounds and demolding products.
- C. Measure the humidity and pH levels in the cement in compliance with the following standards before installation:
  - 1. ASTM F 1869, Anhydrous Calcium Chloride test for Moisture levels. The maximum allowable reading is:
    - 5 lbs/1,000 sq. ft./24 hours (2.26 kg/92.9 sq. m/24 hours) for AD-535 adhesive and 8 lbs/1,000 sq. ft./24 hours (3.63 kg/92.9 sq.m/24 hours) for AD-777;
  - 2. ASTM F 2170, Relative Humidity (RH) test using in situ probes. The maximum allowable reading is 85% RH for AD-777 and AD-535;
  - 3. ASTM F 710, pH levels (test procedure 5.3.1). The readings should be between 8 and 10 for AD-535 and between 8 and 11 for AD-777;
  - 4. The ASTM test frequency recommendation is 3 measures for the first 1,000 sq. ft. (92.9 sq. m) and one measure for each additional 1,000 sq. ft. (92.9 sq. m).
- D. Ensure Moisture, Relative Humidity and pH tests have all been conducted and measurements meet manufacturer's recommendations.

- E. In case of doubt, test the adhesion on the cement subfloor or other surface that will be covered by the flooring. Do the test using the specified flooring and recommended adhesive.

### 3.03 RESILIENT FLOORING INSTALLATION

- A. Install the flooring according to the latest version of American Biltrite's Installation Instructions. Use the tools, adhesives, trowel types and procedures recommended in the instructions.
- B. Acclimatize the subfloor, all flooring material and adhesive for 48 hours before, during and after the installation by maintaining the room temperature between 18°C (65°F) and 24°C (75°F). Afterwards, maintain the temperature between 18°C (65°F) and 29°C (85°F).

### 3.04 CLEANING AND PROTECTION

- A. Remove all excess adhesive immediately after installation as recommended in American Biltrite's Installation Instructions.
- B. Before allowing traffic after installation, consult and follow the recommendations in American Biltrite's Installation Instructions.
- C. Following installation and cleanup, if the work of all other trades has not yet been completed, protect the flooring by laying sheets of non-staining brown Kraft paper, and then a layer of plywood sheets (rolls of non-staining heavy cardboard material could also be used for protection).
- D. Follow the instructions in American Biltrite's Maintenance Instructions when performing initial and regular maintenance procedures.

END OF SECTION 096510

## SECTION 096513 – RESILIENT BASE AND ACCESSORIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Resilient base.
  - 2. Resilient molding accessories.

#### 1.3 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 long.
- C. Samples for Initial Selection: For each type of product indicated.
- D. 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 long.
- E. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

#### 1.4 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 20 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

#### 1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Coordinate mockups in this Section with mockups specified in other Sections.

#### 1.6 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 or more than 90 deg F.

## 1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg 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 or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

### 2.1 THERMOPLASTIC-RUBBER BASE

- A. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
  - 1. Group: I (solid, homogeneous) or II (layered).
  - 2. Style and Location:
    - a. Style A, Straight: Provide in areas with carpet.
    - b. Style B, Cove: Provide in areas with resilient flooring.
      - 1) Profile: As indicated
- B. Thickness: 0.125 inch
- C. Height: As indicated on Drawings.
- D. Lengths: Coils in manufacturer's standard length.
- E. Outside Corners: Job formed or preformed.
- F. Inside Corners: Job formed or preformed.
- G. Colors: As selected by Architect from full range of industry colors.
- H. Basis of Design Product: Tarkett/ Johnsonite

### 2.2 VINYL BASE

- A. Product Standard: ASTM F 1861, Type TV (vinyl, thermoplastic).

1. Group: I (solid, homogeneous) or II (layered).
2. Style and Location:
  - a. Style A, Straight: Provide in areas with carpet.
  - b. Style B, Cove: Provide in areas with resilient flooring.

1) Profile: As indicated

- B. Thickness: 0.125 inch
- C. Height: As indicated on Drawings.
- D. Lengths: Coils in manufacturer's standard length.
- E. Outside Corners: Job formed or preformed.
- F. Inside Corners: Job formed or preformed.
- G. Colors: As selected by Architect from full range of industry colors.

### 2.3 RUBBER MOLDING ACCESSORY

- A. Description: Rubber reducer strip for resilient flooring, joiner for tile and carpet, transition strips
- B. Profile and Dimensions: As indicated
- C. Locations: Provide rubber molding accessories as required
- D. Colors and Patterns: As selected by Architect from full range of industry colors

### 2.4 VINYL MOLDING ACCESSORY

- A. Description: Vinyl reducer strip for resilient flooring, joiner for tile and carpet, transition strips
- B. Profile and Dimensions: As indicated.
- C. Locations: Provide vinyl molding accessories as required
- D. Colors and Patterns: As selected by Architect from full range of industry colors

### 2.5 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.
  1. Adhesives shall have a VOC content of 50 g/L or less.
  2. Adhesives 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."

- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.
- E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

### PART 3 - EXECUTION

#### 3.1 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.

#### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
  - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:

- a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
  - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. 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.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

### 3.3 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.
- H. Job-Formed Corners:
  - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 6 inches in length.
    - a. Form without producing discoloration (whitening) at bends.
  - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 6" in length.
    - a. Miter or cope corners to minimize open joints.

### 3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
  2. Tightly adhere to substrates throughout length of each piece.
  3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

### 3.5 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 marks, 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 one coat.
- E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

## SECTION 096723 – RESINOUS FLOORING

### 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. Resinous flooring system as shown on the drawings and in schedules.
- B. Related sections include the following:
  - 1. Cast-in-Place Concrete, section 033000

#### 1.03 SYSTEM DESCRIPTION

- A. The work shall consist of preparation of the substrate, the furnishing and application of a cementitious urethane based self-leveling seamless flooring system with decorative chip broadcast and Epoxy broadcast and topcoats.
- B. The system shall have the color and texture as specified by the Owner with a nominal thickness of 3/16 inch. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.
- C. Cove base (if required) to be applied where noted on plans and per manufacturers standard details unless otherwise noted

#### 1.04 SUBMITTALS

- A. Product Data: Latest edition of Manufacturer's literature including performance data and installation procedures.
- B. Manufacturer's Material Safety Data Sheet (MSDS) for each product being used.
- C. Samples: A 3 x 3 inch square sample of the proposed system. Color, texture, and thickness shall be representative of overall appearance of finished system subject to normal tolerances.

#### 1.05 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. No requests for substitutions shall be considered that would change the generic type of the specified System.
- D. System shall be in compliance with requirements of United States Department of Agriculture (USDA), Food, Drug Administration (FDA), and local Health Department.
- E. System shall be in compliance with the Indoor Air Quality requirements of California section 01350 as verified by a qualified independent testing laboratory.

- F. A pre-installation conference shall be held between Applicator, General Contractor and the Owner to review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.

#### 1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

##### A. Packing and Shipping

1. All components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.

##### B. Storage and Protection

1. The Applicator shall be provided with a dry storage area for all components. The area shall be between 60 F and 85 F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.
2. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Engineer or other personnel.

##### C. Waste Disposal

1. The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the system.

#### 1.07 PROJECT CONDITIONS

##### A. Site Requirements

1. Application may proceed while air, material and substrate temperatures are between 60 F and 85 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
2. The relative humidity in the specific location of the application shall be less than 85 % and the surface temperature shall be at least 5 F above the dew point.
3. The Applicator shall ensure that adequate ventilation is available for the work area. This shall include the use of manufacturer's approved fans, smooth bore tubing and closure of the work area.
4. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.

##### B. Conditions of new concrete to be coated with cementitious urethane material.

1. Concrete shall be moisture cured for a minimum of 3 days and have fully cured a minimum of 5 days in accordance with ACI-308 prior to the application of the coating system pending moisture tests.
2. Concrete shall have a flat rubbed finish, float or light steel trowel finish (a hard steel trowel finish is neither necessary nor desirable).
3. Sealers and curing agents should not be used.
4. Concrete shall have minimum design strength of 3,500 psi. and a maximum water/cement ratio of 0.45.
5. Concrete surfaces on grade shall have been constructed with a vapor barrier to protect against the effects of vapor transmission and possible delamination of the system.

##### C. Safety Requirements

1. All open flames and spark-producing equipment shall be removed from the work area prior to commencement of application.
2. "No Smoking" signs shall be posted at the entrances to the work area.
3. The Owner shall be responsible for the removal of foodstuffs from the work area.
4. Non-related personnel in the work area shall be kept to a minimum.

## 1.08 WARRANTY

- A. Manufacturer shall warrant that material shipped to buyers at the time of shipment substantially free from material defects and will perform substantially to Manufacturer published literature if used in accordance with the latest prescribed procedures and prior to the expiration date.
- B. Manufacturer liability with respect to this warranty is strictly limited to the value of the material purchase.

## PART 2 – PRODUCTS

### 2.01 FLOORING

- A. Basis of Design: Dur-A-Flex, Inc, Hybri-Flex EC (self-leveling chip broadcast), epoxy/aliphatic urethane topcoat seamless flooring system.
  1. System Materials:
    - a. Topping: Dur-A-Flex, Inc, Poly-Crete MD resin, hardener and SL aggregate.
    - b. The broadcast aggregate shall be Dur-A-Flex, Inc. Macro, Microchip or Earthstone Chip Blend.
    - c. Broadcast: Dur-A-Flex, Inc. Dur-A-Glaze #4, epoxy based two-component resin.
    - d. Seal coats: Dur-A-Flex, Inc Dur-A-Glaze #4, epoxy-based, two-component resin.
    - e. Top coat: Dur-A-Flex, Inc. Armor Top aliphatic urethane 2 component resin with grit.
  2. Finish - Orange Peel Finish
  3. Patch Materials
    - a. Shallow Fill and Patching: Use Dur-A-Flex, Inc. Poly-Crete MD (up to ¼ inch).
    - b. Deep Fill and Sloping Material (over ¼ inch): Use Dur-A-Flex, Inc. Poly-Crete WR.

### 2.02 MANUFACTURER

- A. Basis of Design: Dur-A-Flex, Inc., 95 Goodwin Street, East Hartford, CT 06108, Phone: (860) 528-9838, Fax: (860) 528-2802
- B. Architect Approved Equal.

### 2.03 PRODUCT REQUIREMENTS

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>A. Topping           <ol style="list-style-type: none"> <li>1. Percent Reactive</li> <li>2. VOC</li> <li>3. Bond Strength to Concrete ASTM D 4541</li> <li>4. Compressive Strength, ASTM C 579</li> <li>5. Tensile Strength, ASTM D 638</li> <li>6. Flexural Strength, ASTM D 790</li> </ol> </li> </ol> | Poly-Crete SL<br>100 %<br>0 g/L<br>400 psi, substrates fails<br>9,000 psi<br>2,175 psi<br>5,076 psi |
|---|---|

7.	Impact Resistance @ 125 mils, MIL D-3134, No visible damage or deterioration		160 inch lbs
B.	Broadcast Coat		Dur-A-Glaze #4 Resin
1.	Percent Reactive,		100 %
2.	VOC		<4 g/L
3.	Water Absorption, ASTM D 570		0.04%
4.	Tensile Strength, ASTM D 638		4000psi
5.	Coefficient of thermal expansion ASTM D 696,		2 x 10 <sup>-5</sup> in/in/F
6.	Flammability ASTM D-635		Self-Extinguishing
7.	Flame Spread/ NFPA 101 ASTM E-84		Class A
C.	Topcoat		Armor Top
1.	VOC		0 g/L
2.	60 Degree Gloss ASTM D523		75+/-5
3.	Mixed Viscosity, (Brookfield 25°C)		500 cps
4.	Tensile strength, ASTM D 638		7,000 psi
5.	Abrasion Resistance, ASTM D4060 CS 17 wheel (1,000 g load) 1,000 cycles	Gloss	Satin
		4	8 mg loss with grit
		10	12 mg loss without grit
6.	Pot life @ 70° F 50% RH		2 hours
7.	Dry properties, 70°F, 50% R.H.		8 hours tack free, 12 hours Dry
	60°F, 30% RH		12 hours tack free, 18 hours Dry
	80°F, 70%RH		4 hours tack free, 6 hours Dry
8.	Flash Point PMCC		186°F
9.	Full Chemical resistance		7 days

## 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.
- Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

### 3.02 PREPARATION

#### A. General

- 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.
- Moisture Testing: Perform tests recommended by manufacturer and as follows.
  - Perform anhydrous calcium chloride test ASTM F 1869-98. 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.
  - Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 99% relative humidity level measurement.

- c. If the vapor drive exceeds 99% relative humidity or 20 lbs/1,000 sf/24 hrs then the Owner and/or Engineer shall be notified and advised of additional cost for the possible installation of a vapor mitigation system that has been approved by the manufacturer or other means to lower the value to the acceptable limit.
- 3. Mechanical surface preparation
  - a. 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.
  - b. 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.
  - c. 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.
  - d. Cracks and joints (non-moving) greater than 1/8 inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.
- 4. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.

### 3.03 APPLICATION

#### A. General

- 1. The system shall be applied in five distinct steps as listed below:
  - a. Substrate preparation
  - b. Topping/overlay application with chip broadcast.
  - c. Resin application with chip broadcast.
  - d. Topcoat application
  - e. Second topcoat application.
- 2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
- 3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
- 4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
- 5. A neat finish with well-defined boundaries and straight edges shall be provided by the applicator.

#### B. Topping

- 1. The topping shall be applied as a self-leveling system as specified by the Architect. The topping shall be applied in one lift with a nominal thickness of 1/8 inch.
- 2. The topping shall be comprised of three components, a resin, hardener and filler as supplied by the Manufacturer.
- 3. The hardener shall be added to the resin and thoroughly dispersed by suitably approved mechanical means. SL Aggregate shall then be added to the catalyzed mixture and mixed in a manner to achieve a homogenous blend.
- 4. The topping shall be applied over horizontal surfaces using 1/2 inch "v" notched squeegee, trowels or other systems approved by the Manufacturer.

5. Immediately upon placing, the topping shall be degassed with a loop roller.
6. Chip aggregate shall be broadcast to excess into the wet resin, Macro chip at the rate of 0.1 lbs/sf and Micro chip at the rate of 0.15 lbs/sf.
7. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose chips.

C. Broadcast

1. The broadcast coat resin shall be applied at the rate of 100 sf/gal.
2. The broadcast coat shall be comprised of liquid components, combined at a ratio of 2 parts resin to 1 part hardener by volume and shall be thoroughly blended by mechanical means such as a high speed paddle mixer.
3. Chip aggregate shall be broadcast into the wet resin, Macro chips at the rate of 0.1 lbs/sf, Micro chips at the rate of 0.15 lbs/sf.
4. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose chips.

D. Topcoat

1. The first topcoat shall be squeegee applied with a coverage rate of 100 sf/gal.
2. The topcoat shall be comprised of liquid components, combined at a ratio of 2 parts resin to 1 part hardener by volume and shall be thoroughly blended by mechanical means such as a high speed paddle mixer.
3. The first topcoat will be back rolled and cross rolled to provide a uniform texture and finish
4. The second topcoat with grit shall be roller applied with a coverage rate of 500 sf/gal.
5. The finish floor will have a nominal thickness of 3/16 inch.

### 3.04 FIELD QUALITY CONTROL

A. Tests, Inspection

1. The following tests shall be conducted by the Applicator:
  - a. Temperature
    1. Air, substrate temperatures and, if applicable, dew point.
  - b. Coverage Rates
    1. Rates for all layers shall be monitored by checking quantity of material used against the area covered.

### 3.05 CLEANING AND PROTECTION

- A. Cure flooring material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.
- B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF SECTION 096723

## SECTION 099123 – INTERIOR PAINTING

### PART 1 - GENERAL

- 1.01 SECTION INCLUDES: (See Paint Schedule and finish designations)
- A. Interior painting where required at disturbed finishes, to match existing.
- 1.02 DEFINITIONS
- A. "Paint or Painting" as used in this specification, are in a general sense and include: Sealers, primers, stains; oil, alkyd, latex, epoxy, and enamel type paints; lacquers; fillers; and the application of these materials.
- 1.03 PRODUCT SUBMITTALS
- A. Product Data: Listing of proposed products matched to specified products. Cut sheet for each product indicating generic formulation, sheen, ingredients, percentage by volume, and breakdown of pigment versus vehicle.
  - B. Samples: Full range of custom mixed color chips for selection.
- 1.04 CONTRACT CLOSEOUT SUBMITTALS
- A. Maintenance Materials: Turn over to Owner upon completion; one gallon of each type and color of finish. Include color pigmentation formulation.
- 1.05 PACKING AND DELIVERY
- A. Delivery: Unopened containers with manufacturer's labels indicating type of paint, stock number, color number and instructions.
- 1.06 STORAGE AND PROTECTION
- A. Storage: Do not store volatiles, thinners, and solvents (including rags and tool cleaning pails) within the building.
- 1.07 ENVIRONMENTAL REQUIREMENTS
- A. Temperature:
    - 1. Interior: Constant 65 degrees F. or above. Prevent wide variations in temperature which might result in condensation.
  - B. Avoid painting any surfaces while they are exposed to hot sun.
  - C. Provide proper conditions of ventilation and light; use artificial light in quantity equivalent to normal occupancy lighting.

## PART 2 - PRODUCTS

### 2.01 PAINT AND FINISHES

- A. Manufacturer:  
Benjamin Moore Paint Co. (Product #s specified on Drawings)  
Sherwin Williams (Product #s specified in Specification)  
Pratt & Lambert, Inc.  
ICI Glidden  
M.A. Bruder & Sons, Inc.  
Duron Paints & Wallcoverings  
PPG Industries
- B. Specific products are indicated in painting schedule included at the end of this Section. These products establish a standard of quality. Others may be required to substantiate properties and qualities.
- C. Ready-mixed; well ground, not settle badly, cake or thicken in the container, readily broken up with a paddle to a smooth consistency; and having easy brushing properties; Lead free.
- D. Colors: Standard colors.
  - 1. Refer to Pain Schedule or Colors selected by owner following bid

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Inspection and Surfaces:
  - 1. Carefully examine executed work of other trades which might affect this work.
- B. Protect materials and equipment from damage by painting and finishing.
  - 1. Tape, mask, cover and/or coat adjacent materials, areas, surfaces, and equipment not to receive finishes noted in this Section. Specifically protect wood floors and natural unfinished wood.
  - 2. Before painting, remove hardware, accessories, plates and similar items or provide ample protection of such items.
  - 3. Remove doors, if necessary, to paint bottom edge.
  - 4. Use only skilled mechanics for removing and replacing such items. Upon completion of each space, replace above items.
- C. General Preparation of Surfaces:
  - 1. Prepare all surfaces in accordance with manufacturer's recommendations for product being used.
  - 2. Surfaces: Clean; dry; free of moisture and dampness; smooth, even, true to plane; and free of material which will adversely affect adhesion or appearance of applied coating.

### 3.02 PREPARATION- WOOD SURFACES TO BE PAINTED OR FINISHED

- A. Dry, clean, and free from oil, grease, wax, loose dirt or other foreign matter.
- B. Sand surfaces smooth and even, and then dust off before applying the first coat.
- C. Coat knots, sap streaks, and pitch spots with recommended sealer.
- D. Fill nail holes, cracks, and imperfections.
  - 1. Paint Finish: Use wood putty.
  - 2. Natural or Stain Finish: Use plastic wood filler (match for specie and finish color).
- E. Apply paste wood filler on open grain wood. Wipe across the grain; then with a circular motion to secure a smooth, filled, clean surface with filler remaining in open grain only. After overnight dry, sand surface until smooth.

### 3.03 PREPARATION- METAL SURFACES TO BE PAINTED

- A. Thoroughly clean metal surfaces where rust or scale is present, by the use of wire brushing and/or abrasive paper.
- B. Wash surfaces with mineral spirits to remove any grease, oil or dirt.
- C. Touch-up all shop primed or coated surfaces chipped or abraded, using shop coat material specified. Feather edges of damaged shop coat to achieve smooth finish. Comply with metal preparation as indicated by the manufacturer of the coating.

### 3.04 PREPARATION- MASONRY SURFACES

- A. Masonry Surfaces: Allow to cure at least thirty (30) days before painting. Before apply the first coat of paint, fill all joints and point up all holes, Correct any imperfections. Remove all mortar or plaster droppings and any other foreign matter. Brush surfaces with a stiff bristle or wire brush.
- B. Neutralize free lime with a solution acceptable to the manufacturers of the paint which is to be applied.

### 3.05 PREPARATION - CONCRETE SURFACES

- A. Patch openings, voids, holes, cracks, and irregularities with Portland Cement mortar and finish flush with adjacent surfaces.
- B. Remove contaminants, oil, scum, grease, and the like.
- C. Remove all loose, powdery or dusting surface laitance mechanically (scarification).
- D. Remove form oil from concrete as recommended by paint manufacturer for proper adhesion.
- E. Allow surfaces to dry completely, usually 60 to 90 days of moderate, weather, before painting.

3.06 PREPARATION- GYPSUM BOARD SURFACES

- A. Fill all minor irregularities with spackling compound and sand to smooth, level surfaces. Exercise care to avoid raising nap of paper.
- B. Allow to cure at least 15 days before painting.
- C. Do not use sandpaper on paper surfaces to be painted.
- D. Do not apply paint or sealer when moisture content exceeds that required by paint manufacturer.

3.07 PREPARATION – TECTUM PANELS

- A. Surface must be clean, dry and in sound condition.
- B. Remove all oil, dirt, grease and other foreign material to ensure adequate adhesion.

3.08 APPLICATION OF PAINTS

- A. General Requirements: Comply with manufacturer's instructions including environmental conditions, temperatures, pot life, drying and recoating times. Utilize tools and equipment recommended for products.
  - 1. Do not apply coating until moisture content of surface is within limitations recommended by the paint manufacturer. Test with moisture meter.
  - 2. Apply paint, enamel, stains and varnishes with suitable brushes, rollers or spray equipment which have been kept clean, free from contamination and suitable for finish required.
  - 3. Rate of application of coating shall not exceed that as recommended by the paint manufacturer for the purpose of surface involved.
  - 4. Sand and dust between each coat to remove visible defects and blemishes.
- B. Coverage:
  - 1. Apply not less than 2 separate and distinct coats of finish on all exposed Work throughout.
  - 2. Apply to shop or factory primed surfaces not less than 1 finish coat; in addition to the prime coat.
  - 3. Apply additional coats should there be a deficiency in coverage.
  - 4. Apply additional coats over entire surface until paint film is of uniform finish, color appearance and coverage, specifically when previous color, stain, dirt, spackle, patching or undercoats show through final coats.
  - 5. If problems arise in connection with application of paint, stop painting area immediately and contact paint manufacturer for recommendation.

C. Methods of Application:

1. Brush Application: Brush each coat out uniformly to eliminate laps, skips and excess brush marks. Brush apply field coats on metals, and trim.
2. Roller Application: Use proper skill to avoid signs of lapping and excess paint lines from edge of roller. When cutting in with a brush is required, these areas must be of same texture, color and hiding as adjacent areas, to ensure good appearance.
3. Spray Application: Absolute masking and protective measures shall be taken to avoid damage to other finish materials. Manufacturer's recommendations for dry mil thickness are minimums and square feet per gallon shall not be exceeded. Paints shall not be diluted for purpose of spraying.

D. Drying:

1. Do not apply any type finish until the preceding coats are thoroughly dry and hard.
2. Interior Paint: Allow to dry at least 24 hours between coats.
3. Exterior Paint: Allow to dry at least 48 hours between coats.

E. Appearance: (As visible from 3 feet)

1. Smooth and even; free from runs, sags, skips, streaks and holidays.
2. No variation in sheen or color within continuous surfaces.
3. No clogging of lines and angles of shapes and details.
4. Edges (adjoining other materials or other colors): Paint sharp and clean without overlapping.
5. Coats: Proper consistency and well spread so as to show no laps and brush marks.

3.09 REPAIR AND CORRECTION

- A. Repair damage (resulting from painting) done to the Work of others and existing Work.
- B. Correct Work damage caused by drafty, dusty conditions or cold, to complete satisfaction, without additional cost.
- C. Refinish entire surface where portion of finish has been damaged or is not acceptable.
- D. No claims will be allowed for correction of defective Work caused by failure to adequately prepare substrates and abide by manufacturers recommendations.

3.10 CLEANING

- A. Touch-up and restore where finish is damaged.
- B. Remove spilled, splashed or splattered paint from all surfaces.
- C. Do not mar surface finish of item being cleaned.
- D. Leave storage spaces clean and in condition required for equivalent spaces in project. Leave premises clean and free from all rubbish and accumulated material left from this Work.

PART 4 - SCHEDULE - INTERIOR SURFACES (NORMAL EXPOSURE)

4.01 SCHEDULE

A. MASONRY - (Walls & Ceilings, Concrete, Cement Board)

1. Latex Systems:

a. Semi-Gloss Finish:

1st Coat: S-W ProMar 200 Latex Wall Primer, B28W200  
(4 mils wet, 1.2 mils dry)  
2nd Coat: S-W ProMar 200 Latex Semi-Gloss Enamel, B31 W200  
3rd Coat: S-W ProMar 200 Latex Semi-Gloss Enamel, B31W200  
(4 mils wet, 1.5 mils dry per coat)

B. MASONRY - (CMU - Concrete or Cinder Block)

1. Latex Systems:

a. Semi-Gloss Finish:

1st Coat: S-W ProMar Interior/Exterior Block Filler B25W25  
(75-125 sq.ft./gal.)  
2nd Coat: S-W ProMar 200 Latex Semi-Gloss B31W200 Series  
3rd Coat: S-W ProMar 200 Latex Semi-Gloss B31 W200 Series  
(4 mils wet, 1.5 mils dry per coat)

b. Flat Finish:

1st Coat: S-W ProMar Interior/Exterior Block Filler B25W25  
(75-125 sq.ft./gal.)  
2nd Coat: S-W ProMar 200 Latex Flat Wall Paint B3OW200  
3rd Coat: S-W ProMar 200 Latex Flat Wall Paint B3OW200  
(4 mils wet, 1.4 mils dry per coat)

C. CONCRETE - (Floors)

1. Alkyd Systems:

a. Gloss Finish:

1st Coat: S-W Industrial Enamel, B54Z Series  
2nd Coat: S-W Industrial Enamel, B54Z Series  
(4 mils wet, 2 mils dry per coat)

D. METAL - (Aluminum)

1. Latex Systems:

a. Semi-Gloss Finish:

1st Coat: S-W ProMar 200 Latex Semi-Gloss 631 W200 Series

2nd Coat: S-W ProMar 200 Latex Semi-Gloss B31 W200 Series  
(4 mils wet, 1.5 mils dry per coat)

E. METAL - (Galvanized)

1. Latex Systems:

a. Semi-Gloss Finish:

1st Coat: S-W ProMar 200 Latex Semi-Gloss B31 W200 Series  
2nd Coat: S-W ProMar 200 Latex Semi-Gloss B31W200 Series  
(4 mils wet, 1.3 mils dry per coat)

b. Flat Finish:

1st Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW200  
2nd Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW200  
(4 mils wet, 1.4 mils dry per coat)

F. METAL - Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous & Ornamental Iron, Sashes, Doors, Partitions, Cabinets, Lockers, Fixtures, Equipment, Copper, Non-Galvanized Metal

1. Latex Systems:

a. Gloss Finish:

1st Coat: DTM Acrylic Primer/Finish, B66WI  
(6 mils wet, 3 mils dry)  
2nd Coat: S-W ProMar 200 Latex Gloss, B2IW201 Series  
3rd Coat: S-W ProMar 200 Latex Gloss, B2IW201 Series  
(4 mils wet, 2 mils dry per coat)

b. Semi-Gloss Finish:

1st Coat: DTM Acrylic Primer/Finish, B66W  
(6 mils wet, 3 mils dry)  
2nd Coat: S-W ProMar 200 Latex Semi-Gloss B31W200 Series  
3rd Coat: S-W ProMar 200 Latex Semi-Gloss B31W200 Series  
(4 mils wet, 1.3 mils dry per coat)

c. Flat Finish:

1st Coat: DTM Acrylic Primer/Finish, B66WI  
(6 mils wet, 3 mils dry)  
2nd Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW200  
3rd Coat: S-W ProMar 200 Latex Flat Wall Paint, 83OW200  
(4 mils wet, 1.4 mils dry)

G. WOOD - Walls, Ceilings, Doors, Trim, Cabinet Work, Counters, Partitions, Frames Including Sitka Spruce, Southern Pine, Douglas Fir, Cedar, Redwood, Lauan)

1. Latex Systems:

- a. Gloss Finish:
    - 1st Coat: S-W Wall & Wood Primer, B49WZ2  
(4 mils wet, 2 mils dry)
    - 2nd Coat: S-W ProMar 200 Latex Gloss, B2IW201 Series
    - 3rd Coat: S-W ProMar 200 Latex Gloss, B2IW201 Series  
(4 mils wet, 2 mils dry per coat)
  
  - b. Semi-Gloss Finish:
    - 1st Coat: S-W Wall & Wood Primer, B49WZ2  
(4 mils wet, 2 mils dry)
    - 2nd Coat: S-W ProMar 200 Latex Semi-Gloss, B31 W200 Series
    - 3rd Coat: S-W ProMar 200 Latex Semi-Gloss, B3IW200 Series  
(4 mils wet, 1.5 mils dry per coat)
  
  - c. Egg-Shell Finish:
    - 1st Coat: S-W Wall & Wood Primer, B49WZ2  
(4 mils wet, 2 mils dry)
    - 2nd Coat: S-W ProMar 200 Latex Egg-Shell, B2OW200 Series
    - 3rd Coat: S-W ProMar 200 Latex Egg-Shell, B2OW200 Series  
(4 mils wet, 1.5 mils dry per coat)
  
  - d. Flat Finish:
    - 1st Coat: S-W Wall & Wood Primer, B49WZ2  
(4 mils wet, 2 mils dry)
    - 2nd Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW200
    - 3rd Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW200  
(4 mils wet, 1.4 mils dry per coat)
2. Stained & Varnished (Clear Finish)
- a. Open Grained Wood:
    - 1st Coat: S-W Interior Oil Stain, A48 Series
    - 2nd Coat: S-W SHERWOOD Natural Filler, D7OTI
    - 3rd Coat: S-W Oil Base Varnish, Gloss A66V91
    - 4th Coat: S-W Oil Base Varnish, Gloss or Satin A66 Series
  
  - b. Closed Grain Wood:
    - 1st Coat: S-W Interior Oil Stain, A48 Series
    - 2nd Coat: S-W Oil Base Varnish, Gloss A66V91
    - 3rd Coat: S-W Oil Base Varnish, Gloss or Satin A66 Series  
(4 mils wet, 1.5 mils dry per coat)

H. WOOD - (Floors-Stained, Varnished)

1. Urethane System:

a. Gloss Finish:

1st Coat: S-W Oil Stain  
2nd Coat: S-W Polyurethane Varnish, A67VI/A67FI  
3rd Coat: S-W Polyurethane Varnish, A67VI/A67FI  
(4 mils wet, 1.5 mils dry per coat)

I. DRYWALL - (Walls, Ceilings, Gypsum Board, Etc.)

1. Latex Systems:

a. Gloss Finish:

1st Coat: S-W ProMar 200 Latex Wall Primer, 628W200  
(4 mils wet, 1.2 mils dry)  
2nd Coat: S-W ProMar 200 Latex Gloss, B2IW201 Series  
3rd Coat: S-W ProMar 200 Latex Gloss, B2IW201 Series  
(4 mils wet, 2 mils dry per coat)

b. Semi-Gloss Finish:

1st Coat: S-W ProMar 200 Latex Wall Primer, B28W200  
(4 mils wet, 1.2 mils dry)  
2nd Coat: S-W ProMar 200 Latex Semi-Gloss, B3IW200 Series  
3rd Coat: S-W ProMar 200 Latex Semi-Gloss, B3IW200 Series  
(4 mils wet, 1.3 mils dry per coat)

c. Egg-Shell Finish:

1st Coat: S-W ProMar 200 Latex Wall Primer, B28W200  
(4 mils wet, 1.2 mils dry)  
2nd Coat: S-W ProMar 200 Latex Egg-Shell, B2OW200 Series  
3rd Coat: S-W ProMar 200 Latex Egg-Shell, B2OW200 Series  
(4 mils wet, 1.6 mils dry per coat)

d. Flat Finish:

1st Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW200  
(4 mils wet, 1.4 mils dry)  
2nd Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW200  
3rd Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW200  
(4 mils wet, 1.4 mils dry per coat)

J. TECTUM PANEL FIELD PAINTING

1. Recommended: Sherwin Williams  
Product: Waterborne Acrylic Dry Fall (B42W1) 50 Gal. Drums

2. Recommended Spread Rate per Coat

Wet Mils: 3.5 – 5.0  
Dry Mils: 1.5 – 2.0  
Coverage: 336 – 450 sq. ft./gallon approximate (based on flat surface)  
\*If necessary, cross spray at a right angle

3. Application Condition

Temperature: 50 deg. F minimum, 110 deg. F maximum (air, surface, and material)  
At least 5 deg. F above dew point  
Relative Humidity: 75% maximum  
Dry Time: 20 minutes  
Recoat: 1 hour

4. Application Equipment

The following is a guide. Changes in pressure and tip sizes may be needed for proper spray characteristics.

Airless Spray:

Pressure 2800  
Hose 1/2" ID  
Tip 0.013"  
Reduction As needed up to 10% by volume

Conventional Spray:

Gun Binks 95  
Fluid Nozzle 63C  
Air Nozzle 63PB  
Atomization Pressure 60 psi  
Fluid Pressure 50 psi  
Reduction As needed up to 20% by volume

END OF SECTION 099123

## SECTION 101100 – VISUAL DISPLAY BOARDS

### 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. White markerboards.
  - 2. Natural-cork tack boards.

#### 1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instruction for each material and component part, including data substantiating that materials comply with requirements.
- B. Shop Drawings: For each type of visual display board required.
  - 1. Include dimensioned elevations. Show location of joints between individual panels where unit dimensions exceed maximum panel length.
  - 2. Include sections of typical trim members.
  - 3. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors and textures available for the following:
  - 1. Markerboards: Actual sections of porcelain enamel finish for each type of markerboard required.
- D. Samples for Verification: Of the following products, showing color and texture or finish selected. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected. Prepare Samples from the same material to be used for the Work.
  - 1. Visual Display Boards: Sample panels not less than 8-1/2 by 11 inches, mounted on the substrate indicated for the final Work. Include a panel for each type, color, and texture required.
  - 2. Aluminum Trim and Accessories: Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate. Include Sample sets showing the full range of color variations expected.

#### 1.04 QUALITY ASSURANCE

- A. Source Limitations: Obtain visual display boards through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of visual display boards and are based on the products indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions Procedures."
  - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

#### 1.05 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.
  - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating marker boards without field measurements. Coordinate wall construction to ensure actual dimensions correspond to established dimensions.

#### 1.06 WARRANTY

- A. General Warranty: The special porcelain enamel markerboard warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Porcelain Enamel Markerboard Warranty: Submit a written warranty executed by manufacturer agreeing to replace porcelain enamel markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking within the specified warranty period, provided the manufacturer's written instructions for handling, installation, protection, and maintenance have been followed.
  - 1. Warranty Period: 50 years from date of Substantial Completion.
  - 2. Warranty Period: Life of the building.

### 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. Porcelain Enamel Marker Boards:
  - a. Best-Rite Chalkboard Co.
  - b. Carolina Chalkboard Co.
  - c. Claridge Products and Equipment, Inc.
  - d. Ghent Manufacturing, Inc.
  - e. Greensteel, Inc.
  - f. Lemco, Inc.
  - g. Marsh Chalkboard Company.
  - h. Nelson Adams Company.
  
2. Tackboards:
  - a. Best-Rite Chalkboard Co.
  - b. Carolina Chalkboard Co.
  - c. Claridge Products and Equipment, Inc.
  - d. Ghent Manufacturing, Inc.
  - e. Greensteel, Inc.
  - f. Lemco, Inc.
  - g. Marsh Chalkboard Company.
  - h. Nelson Adams Company.

## 2.02 MATERIALS

- A. Markerboards: Balanced, high-pressure-laminated, porcelain enamel markerboard of 3-ply construction consisting of face sheet, core material, and backing.
  1. Face Sheet: 0.024-inch, "Vitracite," porcelain enamel clad, Type 1, stretcher-leveled aluminized-steel face sheet, as manufactured by Claridge Products and Equipment. Fuse porcelain enamel coating to steel at approximately 1000 deg F (540 deg C).
    - a. Cover Coat: Provide manufacturer's standard matte-finish cover coat, with color selected from manufacturer's standards.
  2. Core: 3/8-inch-thick, particleboard core material complying with requirements of ANSI A208.1, Grade 1-M-1.
  3. Backing Sheet: 0.015-inch-thick, aluminum-sheet backing.
  4. Laminating Adhesive: Manufacturer's standard, moisture-resistant, thermoplastic-type adhesive.
  
- B. Natural-Cork Tack boards: Single-layer, 1/4-inch-thick, seamless, compressed fine-grain, bulletin board quality, natural-cork sheet; face sanded for natural finish; complying with MS MIL-C-15116, Type II.
  1. Backing: Factory laminate cork face sheet under pressure to 3/8-inch-thick fiberboard backing.

## 2.03 ACCESSORIES

- A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch-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. 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 snap-on trim with no visible screws or exposed joints.
  3. Field-Applied Trim: Manufacturer's standard slip-on trim.
  4. Field-Applied Trim: Manufacturer's standard screw-on trim with Phillips flat-head screws.
  5. Chalktray: Manufacturer's standard, continuous, Red Oak tray to match existing.
  6. Map Rail: Furnish map rail at top of each unit, complete with the following accessories:
    - a. Display Rail: Provide continuous cork display rail approximately 1 or 2 inches wide, as indicated, integral with map rail.
    - b. End Stops: Provide one end stop at each end of map rail.
    - c. Map Hooks: Provide 2 map hooks for every 48 inches of map rail or fraction thereof.
    - d. Flag Holder: Provide one flag holder for each room.

## 2.04 FABRICATION

- A. Porcelain Enamel Markerboards: Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, waterproof adhesive.
1. Cut joints straight and true. Space joints symmetrically. Fit and match panels before shipment to provide a continuous, uniform writing surface.
  2. Length: Furnish panels approximately equal in length with permissible variation not more than 3 inches in either direction of equal spacing. Allow 1/4-inch (6.4-mm) clearance at trim in length and width for fitting. Provide lengths of panels in each space as follows:
    - a. Up to 5 feet, 1 panel.
    - b. More than 5 feet but less than 9 feet (2.743 m), 2 panels.
    - c. More than 9 feet but less than 13.5 feet (4.115 m), 3 panels.
    - d. More than 13.5 feet but less than 18 feet (5.486 m), 4 panels.
- B. Assembly: Provide factory-assembled markerboard and tack board units, unless field-assembled units are required.
1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
  2. Provide manufacturer's standard vertical joint system between abutting sections of markerboards.
  3. Provide manufacturer's standard mullion trim at joints between markerboards and tack boards.

## 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: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.
- D. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's specifications for cleaning, conversion coating, and painting.
  - 1. Organic Coating: Thermosetting modified-acrylic enamel primer/topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 1.5 mils (0.04 mm), medium gloss.
  - 2. Color: As selected by Owner from manufacturer's full range of colors.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine wall surfaces, with Installer present, for compliance with requirements and other conditions affecting installation of visual display boards.
  - 1. Surfaces to receive markerboards shall be free of dirt, scaling paint, and projections or depressions that would affect smooth, finished surfaces of markerboards.
  - 2. Surfaces to receive tackboards shall be dry and free of substances that would impair the bond between tackboards and substrate.
  - 3. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- 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, prefit 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.

END OF SECTION 101100

## SECTION 101200 – DISPLAY CASES

### PART 1 – GENERAL

#### 1.01 DESCRIPTION OF WORK

- A. This section includes Recessed Trophy and Display Cases

#### 1.02 REFERENCED STANDARDS

- A. ASTM E84
- B. ASTM B221

#### 1.03 SUBMITTALS

- A. Shop Drawings: Provide shop drawings for each type of recessed display or trophy case required.
- B. Product Data: Provide technical data for materials specified. Include Material Safety Data Sheets, when applicable.
- C. Samples:
  - 1. Manufacturer's color charts.
  - 2. Composition samples of material and trim to illustrate finish, color and texture.
- D. Manufacturer's Instructions: Provide manufacturer's installation instructions.

#### 1.04 OPERATION AND MAINTENANCE

- A. Include data on regular cleaning, stain removal, and precautions

#### 1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame/smoke rating in tackboards in accordance with ASTM E84.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer shall be a firm engaged in the manufacture of display cases in the United States.
- B. Manufacturer shall have a minimum of 5 years' experience in the manufacture of display cases.

#### 1.07 FIELD CONDITIONS

- A. Field measure prior to preparation of shop drawings and fabrication to ensure proper fit.

## 1.08 WARRANTY

- A. Submit a standard warranty, stating that when installed in accordance with manufacturer's instructions and recommendations, Claridge recessed trophy and display cases are guaranteed for one year against defects in materials and workmanship. Guarantee does not cover normal wear and tear, improper handling, any misuse, or any defects caused by vandalism or subsequent abuse. Guarantee covers replacement of defective material but does not include cost of removal or reinstallation.

## PART 2 – PRODUCTS

### 2.01 MANUFACTURERS

- A. Recessed Display and Trophy Cases – 370 and 1370 Series and 390 Series – as manufactured by Claridge Products and Equipment, Inc., Harrison, Arkansas. Phone: 870-743-2200; Toll Free 800-434-4610; Fax: 870-743-1908

### 2.02 MATERIALS

- A. Recessed Trophy and Display Case Fronts
1. Tackable Back Panels: (Select from Claridge Cork; Fabricork; Designer Fabric; Hook-Fab; or Tan Nucork)
  2. Laminate Back Panels: (Select from Walnut or Oak grained low-pressure laminate finish)
  4. Standard Sizes -370 and 1370 Series: 4' x 4'; 4' x 6'; 4' x 8'; 4' x 10'; 4' x 12'; 4' x 16'.
  5. Special sizes on request.
  6. Standard Sizes – 390 Series: 6' x 6'; 6' x 8'; 6' x 10'; 6' x 12'; 6' x 14'; and 6' x 16'. Special sizes on request.
  7. Housing: Architect to select from 370 Series with 3-1/2" extruded aluminum angle perimeter trim; 1370 Series with 3-1/2" extruded aluminum perimeter trim with a 2" radius; or 390 Series with 4" wide face.
  8. Inside depth: Architect to specify inside case depth (up to 24")
- B. Glass Doors: 370 Series - Architect to specify 3/16" tempered hinged or sliding glass doors. (390 Series cases have 1/4" tempered glass sliding doors that slide on ball bearing rollers; fitted with plunger-type locks)
1. Sliding glass doors have ground-in finger pulls, doors slide on glides.
  2. Hinged glass door cases have piano hinge.
    - a. Doors are fitted with flat key tumbler locks.
    - b. 370 Cases 4' and 6' wide have one pair of doors; 8' and 10' have two; and 12' and 16' have three pair of doors. 390 Cases 6' and 8' wide have two doors; 10' wide cases have three doors; and 12', 14' and 16' wide cases

have four doors.

- C. Glass Shelves: Three adjustable glass shelves furnished with brackets and shelf standards. Architect to specify shelf width – 6, 8, 10 or 12-inch wide.
- D. Metal Trim and Accessories: Provide aluminum extrusions as manufactured by Claridge Products and Equipment, Inc. Trim shall be heavy gauge extruded aluminum and shall meet or exceed ASTM B221 alloy standards. Finish to be etched and anodized satin finish. (Color anodized and powder coat finish trim optional.)
- E. Colors: As selected from manufacturer's standard colors. Over 50 standard tackboard colors to choose from. Color charts furnished on request.
- F. Wood Box: (Optional) Architect to specify depth (up to 24") and finish – walnut or oak grained low pressure laminate.
  - 1. Wood box furnished 16" deep unless otherwise specified
  - 2. Wood box shipped KD.
- G. Options: Lights; custom sizes; custom styles

### 2.03 FABRICATION

- A. Shop assembly: Provide factory assembled cases to requirements indicated on shop drawings.
- B. Units shall be of dimensions shown in details and in accordance with manufacturer's shop drawings, as approved by architect.

## PART 3 – EXECUTION

### 3.01 PROJECT CONDITIONS

- A. Verify before installation that interior moisture and temperature approximate normal occupied conditions.
- B. Verify that wall surfaces are prepared and ready to receive cases.

### 3.02 INSTALLATION

- A. Deliver cases KD to be reassembled on job.
- B. Follow manufacturer's instructions for storage and handling of units before installation.
- C. Install level and plumb, in accordance with manufacturer's recommendations.

### 3.03 ADJUST AND CLEAN

- A. Verify that all accessories are installed as required for each unit.
- B. At completion of work, clean glass surfaces, back panels and trim, in accordance with

manufacturer's recommendations, leaving all materials ready for use.

END OF SECTION 101200

## SECTION 101419 – INTERIOR SIGNS

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Contractor to provide interior signs for rooms identified in the scope of work. Sign contractor to provide all necessary graphic layouts required for client approvals, complete message schedule keyed to floor plans and allow for three meetings with client to present and finalize signage design.
- B. Section includes: Interior non-illuminated directional, control and information surface mounted signage as complete integrated modular system.
- C. Unit prices: Provide unit price for each type unit in designated system for extra possible required signage.

#### 1.02 REFERENCES

- A. Standards of the following as referenced:
  - 1. American National Standards Institute (ANSI).
- B. Industry standards:
  - 1. Department of Justice, Office of the Attorney General, "Americans with Disabilities Act", Public Law 101-336 (ADA).
  - 2. ANSI A117.1: Providing Accessibility and Usability for Physically Handicap People, 1986 edition.
  - 3. Federal Register Part III, Department of Justice, Office of the Attorney General, 28 CFR Part 36: Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities, Final Rule, July 26, 1991.
  - 4. Federal Register Part II, Architectural and Transportation Barriers Compliance Board, 36 CFR Part 1191: Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Amendment to Final Guidelines, September 6, 1991.

#### 1.03 DEFINITIONS

- A. Terms:
  - 1. Braille: Grade II Braille including 189 part-word or whole word contractions; see SYSTEM DESCRIPTION Article below.
  - 2. Non-tactile: Letters and numbers on signs with width-to-height ration between 3:5 and 1:1 and stroke width ratio between 1:5 and 1:10 using upper case "X" to calculate ratios. Use Interstate and Helvetica 65 typestyles; upper and lower case lettering is permitted; serif type styles are permitted; see SYSTEM DESCRIPTION Article below.

3. Symbols: Symbol itself is not required to be tactile but equivalent verbal description is required both in tactile letters and Braille for all ADA signage.
4. Tactile: 1/32" raised capital letters without serifs, at least 5/8" height and not more than 2" height based on upper case "X". Braille is required whenever tactile is required; see SYSTEM DESCRIPTION Article below.

#### 1.04 SYSTEM DESCRIPTION

- A. Signage under this section is intended to include items for identification, direction, control and information of building, and to be installed as a complete integrated system.
  1. Interior sign plaques and way finding signs
  2. Vinyl Die Cut graphics
  3. Dedication Plaque
  4. Bulletin Boards and Directories.
- B. ADA design requirements:
  1. Signage requiring tactile graphics:
    - a. Wall mounted signs designating permanent rooms and spaces, such as room numbers, restrooms, electrical closets, mechanical rooms and fire stair identifications.
    - b. Individually applied characters are prohibited.
  2. Signage not requiring tactile graphics but requiring compliance to other ADA requirements: All other signs providing direction to or information about function of space, such as directional signs (signs with arrow), informational signs (operating hours, policies, etc.), regulatory signs (no smoking, do not enter) and ceiling and projected wall mounted signs.
- C. ADA performance requirements:
  1. Tactile graphics sign mounting requirements:
    - a. Single doors: Mount 60" to sign centerline above finished floor and on wall adjacent to latch side of door, as shown on drawings.
    - b. Openings: Mount 60" to sign centerline above finished floor adjacent to opening.
    - c. No wall space adjacent to latch side of door, opening or double doors: Mount 60 " to centerline above finished floor on nearest adjacent wall.
- D. Vinyl Applied Characters  
Vinyl Applied Characters: 3M Series 220 high performance vinyl,  
Color: White.  
Height: As indicated on Drawings.  
Character Style: Helvetica.

## 1.05 SUBMITTALS

- A. Product data:
  - 1. Manufacturer's signed statement regarding compliance with QUALITY ASSURANCE Article.
  - 2. Manufacturer's product literature indicating units and designs selected.
  - 3. Evidence of manufacturer's computerized data retrieval program for tracking of project for sign typography, message strip requirements and other pertinent data from schedule input to final computerized typography on finished product.
- B. Shop drawings
  - 1. Indicate materials, sizes, configurations, applicable substrate mountings.
  - 2. Typography sample for message strips and header copy.
  - 3. Artwork for special graphics.
- C. Samples:
  - 1. Full size samples for specific sign types, if requested by architect, in colors specified. Samples will not be returned for use in project.
  - 2. Submit 6" x 6" color samples as required by the architect.
- D. Contract close out:
  - 1. Furnish appropriate checklist for aiding in reordering after Date of Substantial Completion. Maintain computer schedule program for ordering new signage as required by Owner.
  - 2. Provide an 8½" x 11" re-order form for each sign type and component of each sign type. Forms must be keyed to sign type shown in bid documents using same sign type number.

## 1.06 QUALITY ASSURANCE

- A. Manufacturer qualifications: Work under this section from manufacturers regularly engaged in work of this magnitude and scope for minimum of five years.
- B. Pre-installation conference: Closely coordinate tolerances required in this section for completely coordinated and smooth installation.
- C. Installer must be regularly engaged in work of this magnitude and scope for minimum of five years.
- D. All work shall conform to applicable codes.

## 1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver all signs in fiber board foam, packed and protected for timely installation, minimizing on-site storage time.

- B. Sign contractor to store all signs in a secured area, out of weather and protected, during installation.

#### 1.08 SEQUENCING AND SCHEDULING

- A. Schedule system installation after related finishes have been completed, and in schedule with the project phased construction.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURED UNITS

- A. Acceptable product suppliers:
  1. Designer Sign Systems, 352 Washington Avenue, Carlstadt, NJ 07072  
Phone: (201) 939-5577; Fax: (201) 939-7043 (basis for specifications)
  2. Lettera Signs, 1209 Bronx River Avenue, Bronx NY 10472  
Phone (718) 991-1000, fax (718)542-4218
  3. APCO , 388 Grant Street, SE, Atlanta Georgia,  
Phone: 404-688-9000, fax 404-577-3847

#### 2.02 SUBSTITUTIONS

- A. Prior to presentation of bid proposals, bidders shall submit to the architect/designer a written request for approval of materials, article or piece of equipment which they propose as equal or superior to that specified.
  1. Submissions of such items for consideration by the architect/designer shall be made a minimum of five (5) days prior to bid opening. Submission shall include:
    - a. Specifications or other descriptive literature addressing each of the points called for in the specifications, preferably in the same order as the specifications.  
Literature should address only the products the supplier intended to provide, not the manufacturer's entire product line.
    - b. Submissions must be addressed to architect or as directed by owner.  
Ref. SPECIFIC JOB NAME
- B. If, in the judgment of the architect/designer, the material, article or piece of equipment is acceptable, approval will be given in an addendum (a) issued to all bidders on record by the architect/designer, a minimum of five (5) days prior to bid opening.

#### 2.03 ADA and SUBSURFACE PLAQUE CONSTRUCTION

- A. Tactile copy and Grade II Braille are to be precision embossed a minimum of .032" and formed as an integral part of the sign face. Braille is to be the same color as the sign background with no interruption of the smooth, clean surface of the sign. All plaque

edges to be clean, smooth, free of all saw and tooth marks and painted to match the background color of the sign. ADA compliant fabrication is required for all signs. Phenolic photopolymer is NOT acceptable. Lettering, Braille and symbols to be raised 1/32".

Braille cell to be 1/4", character height to be 5/8" min., 2" max. Interline spacing to be half of cap height. Braille cell to be 1/4" min. below line of copy above.

B. Manufacturer's standard embossed, monolithic tactile plaque sign construction to meet relevant ADA requirements indicated for materials, thickness, finish, colors, designs, shapes, sizes and details of construction. Installed dimensional tolerances to be plus/minus 1/32".

1. Sign Face: .010" transparent polycarbonate with a mar resistant ADA compliant fine velvet finish; precision embossed to form copy and Grade II Braille as an integral part of the sign face. Background color is applied subsurface. Copy colors are a subsurface applied abrasion resistant pigment with a satin finish. Embossed copy and Braille cavities are backfilled, providing solid copy and Braille. Braille is the same color as the sign face background with no interruption of the surface of the sign face. Sign face is laminated to .125" plastic base.

2. Raised copy/Braille: Sign copy and Braille to be raised 1/32" min. from plaque first surface by by manufacturer's embossing process. Precisely formed, uniformly opaque Braille to meet relevant ADA regulations and the requirements indicated for size, style, spacing, content, position and colors. Embossed graphic cavities are backfilled providing solid copy and Braille. Translation of sign copy to be the responsibility of the manufacturer.

3. Subsurface reverse screened acrylic sign components, consisting of .080 matte acrylic panels laminated to 1/8 clear acrylic back plate. All edges to be clean and smooth free of any tooling marks. Screen printed images to be produced with screen mesh suitable to provide consistent crisp, clear images (minimum 280 mesh).

4. All symbols and letter forms are to faithfully reproduce specified letter, alpha/numeric and symbol forms.

5. Mounting: Plaque sign mounts with 3M 1/32" double-sided vinyl tape, or foam tape. (VERIFY WALL PAINT FINISH TO DETERMINE PROPER TAPE TO BE USED).

Option: Mechanical mounting using tape mounting as noted above and also using 4 tamper proof screws to nylon wall shields for masonry and sheet rock construction.

6. Dedication plaque

Stainless steel building dedication plaque. Fabricate from tempered 3/16" stainless steel plate, alloy #304 with a #6 horizontal grain finish. Graphics to be acid etched to 1/32' minimum. All copy to be clear and free of ragged edges or other imperfections. Fill copy with a two part epoxy ink suitable for the use intended. All edges to be clean, smooth and free of any tooling marks. Clear coat entire plaque with a semi gloss sealer suitable for both interior and exterior use. Plaque to mount with 1/4" diameter stainless steel pins welded or drilled and tapped to the rear surface.

7. Directories and bulletin boards

- a. Wall mounted directory and bulletin boards 2-1/2" deep in sizes as shown on the drawings. Custom engineered one piece seamless fiber reinforced polyester (FRP) monolith consisting of initial gel coat sealing layer with multi layers of thermoset polyester resin and glass fiber strands molded in form moulds maintaining module configuration to 3/16" thickness. Provide structural reinforcement within each unit to prevent racking and misalignment. Top and bottom edges to have manufacturer's standard bevel edge. Glazing to be E.I. Dupont de Nemours and Company Inc. Lucite 8 SAR 3/16" thickness super abrasion resistant clear acrylic plastic.
- b. Unit to have manufacturer's standard bevel edge. Glazing to be E.I. Dupont de Nemours and Company Inc. Lucite 8 SAR 3/16" thickness super abrasion resistant clear acrylic plastic.

## 2.04 FABRICATION

### A. Shop Assembly:

1. Fabricate units to configurations indicated on reviewed shop drawings. Internally reinforce units in accord with reviewed shop drawings.
2. Provide copy required on inserts, message strips, headers or bases and covers required on reviewed shop drawings and in accord with ADA requirements.
3. Fill directories with combination of reviewed copy on message strips on blank message strips.
4. Wrap each individual unit with clear polyethylene (see-through) pack and ship by floor in numerical order, tagged sequentially to message schedule.
5. A final copy of the message schedule provided in this bid package is to be provided to the client for their review and approval prior to any fabrication.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

#### A. Verification of conditions:

1. Examine areas to receive signage; notify architect/designer in writing of unacceptable substrate.
2. Beginning work indicates acceptance of substrate. Subsequent modifications to substrate or modules becomes this section's complete responsibility.

### 3.02 INSTALLATION

- A. Contact the architect/designer if there are any questions as to suitability of the installation location or installation surface.
- B. Install signs in locations with mounting types indicated in accord with reviewed shop drawings. Square, plumb and level units.

- C. Install inserts not more than 48 hours prior to Date of Substantial Completion complete with correct copy in place. Conform to ADA requirements for tactile graphics signage.

### 3.03 CLEANING

- A. Clean exposed surfaces using non-abrasive cleaning agents such as soap and water or as recommended by manufacturer not more than 48 hours prior to Date of Substantial Completion in accordance with manufacturer's written cleaning instructions.
- B. Maintain signs according to maintenance instructions as provided by the manufacturer.

### 3.04 SCHEDULES

- A. Contractor to coordinate schedule with Owner.
- B. Refer to Room Finish Schedule for Signage Requirements.

Set 1: Assembly Spaces/ Offices / Storage / Janitor's Closets/ Mechanical Rooms/ Kitchen  
Room name and room number; Words and numbers must be converted to Grade 2 Braille and applied to the sign.

Set 2: Toilet Rooms  
Room name and number; ADA and sex pictograms. Words and numbers must be converted to Grade 2 Braille and applied to the sign. ADA room signage shall be provided as detailed on drawing A6.11 and the requirements of the New York State Education Department.

Set 3: Stair  
Room name, stair designation, stair pictogram; Words and numbers must be converted to Grade 2 Braille and applied to the sign.

Set 4: Classrooms  
Room name and room number; Words and numbers must be converted to Grade 2 Braille and applied to the sign. Interchangeable teacher name plate insert.

Set 5: Maximum Occupancy Signs  
Maximum occupancy for places of assembly, Maximum Occupancy signage shall be provided as detailed on drawings and per the requirements of the New York State Education Department.

END OF SECTION 101419



## SECTION 102116 – SOLID PLASTIC TOILET COMPARTMENTS

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Solid plastic toilet compartments & urinal screens.
- B. Related Sections:
  - 1. Division 01: Administrative, procedural, and temporary work requirements.

#### 1.2 REFERENCES

- A. ASTM International (ASTM):
  - 1. B85 - Standard Specification for Aluminum-Alloy Die Castings.
  - 2. B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
  - 3. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. National Fire Protection Association (NFPA) 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

#### 1.3 SYSTEM DESCRIPTION

- A. Compartment Configurations:
  - 1. Toilet partitions: Floor mounted, overhead braced.
  - 2. Urinal screens: Wall mounted.

#### 1.4 SUBMITTALS

- A. Submittals for Review:
  - 1. Shop Drawings: Include dimensioned layout, elevations, trim, closures, and accessories.
  - 2. Product Data: Manufacturer's descriptive data for panels, hardware, and accessories.
  - 3. Samples: 6 x 6 inch samples showing available colors in each color.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 5 years' experience in manufacture of solid plastic toilet compartments with products in satisfactory use under similar service conditions.
- B. Installer Qualifications: Minimum 5 years' experience in work of this Section.

#### 1.6 WARRANTIES

- A. Provide manufacturer's 25 year warranty against breakage, corrosion, and delamination under normal conditions.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Contract Documents are based on Eclipse by Scranton Products.

[www.scrantonproducts.com](http://www.scrantonproducts.com)

B. Substitutions: Under provisions of Division 01.

## 2.2 MATERIALS

A. Doors, Panels and Pilasters:

1. High density polyethylene (HDPE), fabricated from extruded polymer resins, forming single thickness panel.
2. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils, markers, and other writing instruments.
3. 1 inch thick with edges rounded to 1/4 inch radius.
4. Fire hazard classification: Not required.

B. Aluminum Extrusions: ASTM B221, 6463-T5 alloy and temper.

C. Aluminum Die Castings: ASTM B85, A380 alloy.

D. Injection Molded Plastic: High density polyethylene.

E. Rubber: Abrasion resistant Styrene Butadiene Rubber, 65 to 80 Shore A durometer, black.

## 2.3 HARDWARE

A. Hinges:

1. Inswing hinges:
  - a. Hidden pivot type fabricated from heavy-duty cast aluminum.
  - b. Auto-close feature, adjustable to 15 degree open position.
  - c. Mounted to doors with stainless steel Torx head screws and through bolted to metal post with tamper proof Torx head sex bolts.
  - d. Hinge pivot point: 6 to 8 inches from edge of door; maintain sufficient clearance to water closet.
2. Outswing hinges:
  - a. Fabricated from extruded aluminum.
  - b. Auto-close feature, adjustable to 15 degree open position.
  - c. Surface mounted to doors with stainless steel Torx head screws and fastened to metal posts with countersunk tamper proof screws.
3. Provide for field adjustment of plus or minus 0.125 inch laterally and plus or minus 0.125 inch vertically.

B. Door Keeper:

1. 3.5 inches long, fabricated from heavy duty extruded aluminum, clear anodized finish.
2. Mount in gap between dividing panel and door.

C. Latch and Housing:

1. Heavy duty extruded aluminum.
2. Latch housing: Clear anodized finish.
3. Slide bolt and button: Black anodized finish.

D. Coat Hook/Bumper: Combination type, chrome plated Zamak.

E. Door Pulls:

1. Heavy duty extruded aluminum, clear anodized finish.
2. Single component providing door pull capability on outswing doors.

## 2.4 COMPONENTS

- A. Doors and Dividing Panels:
  - 1. 72 inches high, mounted 4 to 10 inches above finished floor.
  - 2. Doors: 60 degree angle on two opposite edges for enhanced privacy.
  - 3. Dividing panels: Two modular pieces, both slotted on one edge to accept wall bracket.
- B. Metal Posts: 82.75 inches high, heavy duty extruded aluminum, clear anodized finish, fastened to foot with stainless steel tamper resistant screw.
- C. Hidden Shoe (Foot): One-piece molded polyethylene invisible shoe inserted into metal post and secured to metal post with stainless steel tamper resistant screw.
- D. Headrail Cap and Corner Cap: One-piece molded polyethylene secured to metal post with stainless steel tamper resistant screw; adjustable to level headrail to finished floor.
- E. Hidden Wall Brackets: 71 inches long, heavy duty extruded aluminum, clear anodized finish, inserted into slotted panel and fastened to panels with stainless steel tamper resistant screws.
- F. Headrail: Heavy duty extruded aluminum, designer anti-grip design, clear anodized finish, fastened to headrail bracket with stainless steel tamper resistant screw and to headrail cap or corner cap with stainless steel tamper resistant screw.
- G. Headrail Brackets: Heavy duty extruded aluminum, clear anodized finish, secured to wall with stainless steel tamper screws.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install compartments in accordance with manufacturer's instructions and approved Shop Drawings.
- B. Install rigid, straight, plumb, and level.
- C. Locate bottom edge of doors and panels: coordinate with interior elevations
- D. Provide uniform, maximum 3/8 inch vertical clearance at doors.
- E. Not Acceptable: Evidence of cutting, drilling, or patching.

### 3.2 ADJUSTING

- A. Adjust doors and latches to operate correctly.

END OF SECTION 102116



## SECTION 102800 - WASHROOM ACCESSORIES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Washroom accessories as scheduled in this Section and as indicated on the Drawings.

#### 1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry, coordination with blocking.
- B. Section 092900 - Gypsum Board, coordination with blocking.
- C. Section 102116 – Solid Plastic Toilet Compartments, coordination with accessories.

#### 1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's data sheets for each product specified, including the following:
  - 1. Installation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Cleaning and maintenance instructions.
  - 4. Replacement parts information.
- B. Schedule: Submit a toilet accessory schedule, indicating the type and quantity to be installed in each washroom. Use room numbers as indicated on the Drawings.
- C. Country of Origin: Manufacturer must supply, with first submittal, Country of Origin information for each type of washroom accessory for this project.

#### 1.04 QUALITY ASSURANCE

- A. Manufacturer: Provide products manufactured by a company with a minimum of 10 years successful experience manufacturing similar products.
- B. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.
- C. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.
- D. Hazardous Materials: Comply with EU Directive "Restrictions of Hazardous Substances (RoHS) requirements."

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

## 1.06 WARRANTY

- A. Manufacturer's Warranty for Washroom Accessories: Manufacturer's standard 1 year warranty for materials and workmanship.
- B. Manufacturer's Warranty for Electric Hand Dryers: Manufacturer's standard 10 year warranty on parts, except 3 year warranty on motor brushes from date of purchase. Does not include Bobrick Compac Model B-710, or Bobrick QuietDry Models B-770 and B-778.

## PART 2 PRODUCTS

### 2.01 MANUFACTURER

- A. Basis of Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Bobrick Washroom Equipment, Inc., [www.bobrick.com](http://www.bobrick.com). Location of manufacturing shall be the United States.
- B. Substitutions: The Architect will consider products of comparable manufacturers as a substitution, pending the contractor's submission of adequate documentation of the substitution in accordance with procedures in Division 1 of the Project Manual. Documentation shall include a list of five similar projects of equivalent size where products have been installed for a minimum of two years, and manufacturer's certification that products are fabricated in the United States.

### 2.02 TOILET ACCESSORY SCHEDULE

- A. Refer to accessory schedule on drawings.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
  1. Verify blocking has been installed properly.
  2. Verify location does not interfere with door swings or use of fixtures.
  3. Comply with manufacturer's recommendations for backing and proper support.
  4. Use fasteners and anchors suitable for substrate and project conditions
  5. Install units rigid, straight, plumb, and level, in accordance with manufacturer's installation instructions and approved shop drawings.
  6. Conceal evidence of drilling, cutting, and fitting to room finish.
  7. Test for proper operation.

### 3.02 CLEANING AND PROTECTION

- A. Clean exposed surfaces of compartments, hardware, and fittings using methods acceptable to the manufacturer.
- B. Touch-up, repair or replace damaged products until Substantial Completion.

END OF SECTION 102800

## SECTION 104400 – FIRE PROTECTION SPECIALTIES

### PART 1 - GENERAL

#### 1.01 SUMMARY

A. Section Includes:

1. Fire extinguishers.
2. Extinguisher cabinets.
3. Accessories.

B. Related Requirements:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
2. Section 013300 - Submittal Procedures: For administrative and procedural requirements for processing of submittals during the construction phase.
3. Section 017700 - Closeout Procedures: For administrative and procedural requirements for completion of the Work.

#### 1.02 REFERENCES

A. Reference Standards:

1. ASTM International (ASTM):
  - a. ASTM E814-11a, Standard Test Method for Fire Tests of Penetration Firestop Systems.
2. International Code Council (ICC):
  - a. International Building Code (IBC) – 2015 Edition.
3. Intertek Testing Services/Warnock-Hersey International (ITS/WHI)
4. National Fire Protection Association (NFPA):
  - a. NFPA 10-2010, Standard for Portable Fire Extinguishers: For criteria covering installations for Class A, B, C, D, and K hazards as well as the selection, inspection, maintenance, recharging, and testing of portable fire extinguishing equipment.
  - b. NFPA 70-2011, National Electrical Code.
5. Underwriters Laboratories, Inc. (UL)
6. United States Code (USC):
  - a. Americans with Disabilities Act of 1990, as amended by the ADA Amendments

Act of 2008: For restrictions relating to cabinet projections in corridors.

### 1.03 ACTION SUBMITTALS

A. Submit in accordance with Section 01 33 00.

1. Product Data:

- a. Cabinets: Materials description for fire extinguisher cabinets include roughing-in dimensions, details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, door style and materials.
- b. Extinguishers: Materials description for fire extinguishers; include ratings and classifications.
- c. Installation instructions for each product specified.

2. Shop Drawings:

- a. Small-scale plans showing locations of fire extinguisher cabinets and individual fire extinguishers.
- b. Schedules showing each type of cabinet and extinguisher to ensure proper fit and function.
- c. Indicate installation procedures and accessories required for a complete installation.

3. Samples:

- a. Extinguisher Cabinet Door and Trim Finishes: For each type of exposed finish required, prepared on samples of size indicated below:
  - 1) Size: 6 inches (150 mm) square.

### 1.04 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

### 1.05 QUALITY ASSURANCE

- A. Comply with standards referenced in Article 1.02 - REFERENCES.
- B. Provide fire extinguishers, cabinets and accessories produced by a single manufacturer.
- C. Provide fire extinguishers of type approved by UL, State Fire Marshal's Office, and local regulatory agencies, if any.
- D. 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.

### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle fire protection specialties and related materials using means and methods that will prevent damage, deterioration, or loss.

1. Deliver components in manufacturer's original packaging, properly labeled for

identification.

## 1.07 WARRANTY

All Fire Protection Products (except fire extinguishers) carry a one year warranty after date of shipment against defects in materials or workmanship. Fire extinguishers carry a longer warranty. We will replace or repair any product found defective within this period. No other warranty expressed or implied is valid. Manufacturer's warranty, terms and conditions apply in all cases. Please see complete [warranty](#) on our website for more details.

## PART 2 - PRODUCTS

### 2.01 FIRE PROTECTION SPECIALTIES MANUFACTURERS

#### A. Acceptable Manufacturers:

JL Industries, Inc., a division of Activar Construction Products Group

9702 Newton Av S

Bloomington, MN 55431

(800) 554-6077

(952) 835-6850

(952) 835-2218 (FAX)

SALES@ACTIVARCPG.COM

[www.activarcpg.com](http://www.activarcpg.com)

#### B. Substitutions: Manufacturers seeking approval of their products are required to comply with the Owner's Instructions to Bidders, generally contained in the Project Manual.

### 2.02 FIRE EXTINGUISHERS

#### A. Contractor is to provide and install Fire Extinguishers and cabinets as noted on plans.

#### B. Pressurized Water Type: Extinguisher unit containing water and compressed air; nontoxic.

1. Construction: Butt-welded 304-L stainless steel cylinder with stainless steel discharge lever and fixed carry handle, O-ring seal, replaceable valve stem seal, visual pressure gage, pull pin, and UL-labeled chemical engine hose.

2. Effectiveness (Rating): Class A fires.

#### C. Multi-Purpose Chemical Type: Extinguisher unit containing a fluidized and siliconized mono ammonium phosphate powder; nonconductive and nontoxic.

1. Construction: Heavy duty steel cylinder with metal valve and siphon tube, O-ring seal, replaceable valve stem seal, visual pressure gage, pull pin and upright

- squeeze grip.
  - 2. Finish: Factory powder-coated; Red.
  - 3. Effectiveness (Rating): Class A, B, and C fires.
- D. Carbon Dioxide Type: Extinguisher unit containing liquid carbon dioxide under pressure; nonconductive.
  - 1. Construction: Lightweight, high pressure, aluminum cylinder with O-ring seal, metal valve, replaceable molded valve stem seal, and pull pin.
  - 2. Finish: Factory powder-coated; Red.
  - 3. Effectiveness (Rating): Class B and C fires.
- E. Regular Dry Chemical Type: Extinguisher unit containing a siliconized dry sodium bicarbonate base; nontoxic.
  - 1. Construction: Heavy duty steel cylinder with metal valve and siphon tube, O-ring seal, replaceable valve stem seal, visual pressure gage, pull pin, and upright squeeze grip.
  - 2. Finish: Factory powder-coated; Red.
  - 3. Effectiveness (Rating): Class B and C fires.
- F. Halotron® Type: Extinguisher unit containing a clean extinguishing agent Halotron® 1 approved by the EPA, accepted and specified by the government, and approved by the FAA for use in airports; nonconductive.
  - 1. Construction: Drawn steel cylinder with steel siphon tube, O-ring seal, power cone discharge system, replaceable valve stem seal, visual pressure gage, pull pin, and upright squeeze grip.
  - 2. Finish: Factory powder-coated; Red.
  - 3. Effectiveness (Rating): Class A, B, and C fires.
- G. Class K Wet Chemical Type: Extinguisher unit containing a low "pH" potassium acetate solution.
  - 1. Construction: Stainless steel cylinder with protective nozzle tip orifice seal and nonmetallic nozzle tip finger guard, O-ring seal, replaceable valve stem seal, visual pressure gage, pull pin, and upright squeeze grip.
  - 2. Effectiveness (Rating): Class K fires.
- H. Water Mist Type: Extinguisher unit containing water; nontoxic.
  - 1. Construction: Nonmagnetic cylinder and misting nozzle, O-ring seal, replaceable valve stem seal, visual pressure gage, and pull pin.
  - 2. Finish: Factory powder-coated; White.
  - 3. Effectiveness (Rating): Class A and C fires.
- I. Accessories:

1. Mounting Brackets:
  - a. Standard Brackets: Provide manufacturer's standard steel bracket, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated.

## 2.03 EXTINGUISHER CABINETS

### A. Cabinet with Acrylic Bubble Door: Clear Vu Series

1. Cabinet Style: Semi-recessed
2. Components:
  - a. Tub (Recessed and Semi-recessed cabinets): Cold-rolled steel.
  - b. Stainless Steel Door and Trim Construction: Flush doors with 5/8 inch (15.88 mm) door stop attached by continuous hinge and equipped with zinc-plated handle with roller catch.
    - 1) Finish: Factory-applied ground and polished finish.
      - a) Standard Finish: #4 directional satin finish.
  - c. Bubble: Acrylic bubble with 2-1/2 inch (63.50 mm) projection.
    - 1) Standard Color: 25 - Clear.
  - d. Trim Style and Depth:
    - 1) Semi-Recessed Cabinet:
      - a) Square Edge: 1-1/2 inch
3. Fire-Rating: Fire-Rated for 1-hour and 2-hour combustible and noncombustible wall systems

## 2.04 SOURCE QUALITY CONTROL

- A. Ship extinguishers to the Project site fully charged, EXCEPT those which contain water as an extinguishing agent, if any.
- B. Obtain Fire Extinguishers and Fire Extinguisher Brackets from same manufacturer to ensure compatibility.

## 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 fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
  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.

### 3.03 FIELD QUALITY CONTROL

- A. 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.

### 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.

END OF SECTION 104400

## SECTION 105113 – METAL ATHLETIC LOCKERS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. DESCRIPTION: Furnish and install factory-assembled Heavy-Duty MIG-Welded Metal Lockers in multiple column units to meet job conditions, as shown and specified per contract documents.

#### 1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Concrete: Section 03 10 00
- B. Rough Carpentry: Section 06 10 00
- C. Finish Carpentry: Section 06 20 00

#### 1.3 SUBMITTALS

- A. GENERAL: Refer to Section 01 30 00 ADMINISTRATIVE REQUIREMENTS - SUBMITTALS
- B. SHOP DRAWINGS: Submit drawings showing locker types, sizes, quantities, including all necessary details relating to anchoring, trim installation and relationship to adjacent surfaces.
- C. COLOR CHARTS: Provide color charts showing manufacturer's available colors (minimum 24). Provide metal samples upon request.
- D. NUMBERING: Locker numbering sequence will be provided by the approving authority and noted on approved shop drawings returned to the locker contractor.

#### 1.4 QUALITY ASSURANCE

- A. MANUFACTURING STANDARD: Provide metal lockers that are standard products of a single manufacturer, with interchangeable like parts. Include necessary mounting accessories, fittings, and fastenings.
- B. FABRICATOR QUALIFICATIONS: Firm experience (minimum 5 years) in successfully producing the type of metal lockers indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.
- C. INSTALLER QUALIFICATIONS: Engage an experienced (minimum 2 years) installer who has successfully completed installation of the type of metal lockers and extent to that indicated for this project.

#### 1.5 PRODUCT HANDLING

- A. GENERAL: All work shall be fabricated in ample time so as to not delay construction process.

- B. DELIVERY: All materials shall be delivered to the site at such a time as required for proper coordination of the work. Materials are to be received in the manufacturer's original, unopened packages and shall bear the manufacturer's label.
- C. STORAGE: Store all materials in a dry and well-ventilated place adequately protected from the elements.

## 1.6 WARRANTY

- A. All-Welded Lockers are covered against all defects in materials and workmanship excluding finish, damage resulting from deliberate destruction and vandalism under this section for the lifetime of the facility.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. AVAILABLE MANUFACTURERS: Subject to compliance with the design, material, method of fabrication and installation as required in this specification section or modified as shown on drawings.
- B. BASIS-OF-DESIGN: Lockers shall be "AMP-1002 Champ Athletic Lockers" as manufactured by Art Metal Products or preapproved equal.

### 2.2 LOCKER TYPES

- A. Welded Metal Athletic Lockers:
  1. Doors: 14 gauge diamond perforated sheet steel with recessed handle, and multi-point gravity lift-type latching
  2. Sides: 16 gauge diamond perforated sheet steel
  3. Tops, Bottoms, Shelves: 16 gauge solid sheet steel
  4. Backs: 18 gauge solid sheet steel

### 2.3 FABRICATION

- A. MATERIALS:
  1. Steel Sheet: All sheet steel used in fabrication shall be prime grade free from scale and imperfections and capable of taking a heavy coat of custom blend powder coat.
  2. Fasteners: Cadmium, zinc or nickel plated steel; bolt heads, slot less type; self-locking nuts or lock washers.
  3. Hardware: Hooks and hang rods of cadmium plated or zinc plated steel or cast aluminum.
  4. Handle: Seamless drawn 304 stainless steel recessed handle.
  5. Number Plates: To be polished aluminum with not less than 3/8" high etched numbers attached to door with two aluminum rivets.

- B. CONSTRUCTION: All lockers shall be factory-assembled, of all MIG welded construction, in multiple column units to meet job conditions. Assembly of locker bodies by means of bolts, screws, or rivets will not be permitted. Welding of knockdown locker construction or spot welding is not acceptable. Grind exposed welds and metal edges flush and make safe to touch.
1. Finishing: All locker parts to be cleaned and coated after fabrication with a seven stage zinc/iron phosphate solution to inhibit corrosion, followed by a coat of high grade enamel electrostatically sprayed and baked at 325 degrees Fahrenheit for a minimum of 30 minutes to provide a tough durable finish. Color to be selected from manufacturer's standard list of colors. Two-Tone Color Combination: Shall be at no additional cost with the locker body, frame and trim chosen from one color and the doors may be one of any other color chosen from manufacturers standard selection.
  2. Unibody/Vertical Side Panels: Shall be of integral frame and side wall construction manufactured from solid 16 gauge sheet steel. The one-piece side/frame shall be formed to provide a continuous door strike on the hinge side. An additional continuous vertical door strike shall be achieved at the latch side by MIG welding a 16 gauge full height channel frame member to the integral locker side producing a rigid torque-free welded locker body. The frame shall include a tab which engages a slot in the base locking the side panel and frame into position. Sides to be diamond perforated.
  3. Integral Frame Locker Base: 16 gauge formed sheet steel with double return flanges at the front and rear. A full depth horizontal channel shall be MIG welded under the locker bottom front-to-back at the left and right side of each welded locker unit as well as beneath each vertical side panel for maximum rigidity.
  4. Flat Tops: Shall be formed of one piece of 16 gauge cold rolled sheet steel and shall be an integral part MIG welded to each vertical side panel frame member and be continuous to cover the full width of a multiple locker unit.
  5. Hat Shelves, Intermediate Shelves and Bases: Shall be 16 gauge sheet steel, have double bends at front and shall be MIG welded to the sides.
  6. Bacs: Shall be 18 gauge cold rolled sheet steel, be continuous to cover a multiple unibody unit and be welded to each vertical side panel.
  7. Door: Doors 20" high and over and 15" wide and under shall be fabricated from single sheet prime 14 gauge with single bends at top and bottom and double bends at the sides. The channel formed by the double bend at the latch side is designed to fully conceal the lock bar. Doors to be perforated with 5/8" x 1-1/2" diamonds.
  8. Handle: All locker doors shall have a seamless drawn 304 stainless steel recessed handle shaped to receive a padlock or built-in combination lock. The recess pan shall be deep enough to have the lock be completely flush with the outer door face. A finger lift/padlock hasp shall protrude through the top of the handle for easy opening of the locker door.
  9. Latching: The latching mechanism shall be finger lift control type constructed of 14 gauge (minimum) steel with a nylon cover that has a generous finger pull. Spring activated nylon slide latches shall be completely enclosed in the lock channel allowing doors to close with the lock in the locked position. Locking device shall be designed for use with either built-in combination locks or padlocks. Latch hooks shall be 12 gauge (minimum) and shall be MIG welded to vertical frame member. Provide three latch hooks for doors 48" and over and two for doors under 48".

10. Door Hinges: Hinges for wardrobe doors shall not be less than 16 gauge continuous piano type, securely riveted to frame and welded to the door. All doors shall be right hand side hinged.

#### 2.4 LOCKER ACCESSORIES:

- A. Locks: Shall be master keyed to one system for the entire project.
  - 1. Combination Padlocks: Combination padlock, key controlled.
- B. Equipment: Furnish each locker with the following items, unless otherwise shown.
  - 1. Single tier lockers: Openings 60" and 72" shall include one hat shelf, one double prong ceiling hook and a minimum of two single prong wall hooks.
  - 2. Double & triple tier lockers: Openings 20" thru 36" high shall include one double prong ceiling hook and a minimum of two single prong wall hooks.
  - 3. Finished End Panels: Shall be "Boxed" type formed from 16 gauge cold rolled steel with 1" O.D. double bends on sides and a single bend at top and bottom with no exposed holes or bolts. If lockers have slope tops, end panels must be formed with slope at top to cover the ends of the slope tops. Finished to match lockers. Provide at all exposed ends.
  - 4. Fillers (if required): Provide where indicated, of not less than 16 gauge sheet steel factory fabricated and finished to match lockers.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. GENERAL: Installation shall be in strict conformance with referenced standards, the manufacturer's written directions, as shown on the drawings and as herein specified.
- B. PLACEMENT: Lockers shall be set in place, plumb, level, rigid, flush and securely attached to the wall (or bolted together if back-to-back) and anchored to the floor or base according to manufacturer's specifications.
- C. ANCHORAGE: About 48" O.C., unless otherwise recommended by manufacturer, and apply where necessary to avoid metal distortion, using concealed fasteners. Friction cups are not acceptable.
- D. TRIM: Sloping tops, metal fillers and end panels shall be installed using concealed fasteners. Provide flush, hairline joints against adjacent surfaces.

#### 3.2 ADJUSTMENT

- A. GENERAL: Upon completion of installation, inspect lockers and adjust as necessary for proper door operation. Touch-up scratches and abrasions to match original finish.

END OF SECTION 105113

## SECTION 116623 - GYMNASIUM PROTECTION ACCESSORIES

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section includes: Wall mounted protection pads suitable for gymnasiums.

#### 1.02 SUBMITTALS

- A. Submit in accordance with Section 013300 - Submittal Procedures:
  - 1. List of proposed products and product data.
  - 2. Shop drawings showing elevations, dimensions, fabrication details, and method of attachment.
  - 3. Samples of protection pad cover fabrics for selection by Architect.
  - 4. Manufacturer's installation and maintenance instructions.

### PARTS 2 - PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Basis of Design: Draper, Inc., 411 South Pearl Street, Spiceland, Indiana 47385-0425; 765-987-7999.
- B. Manufacturers of equivalent products submitted and approved in accordance with Section 01630 - Product Substitution Procedures.

#### 2.02 UL GREENGUARD GOLD CERTIFIED, CLASS A FLAME RETARDANT WALL PROTECTION PADS

- A. Type: UL GREENGUARD Gold certified, Class A Flame Retardant fabric covered foam wall protection pads; Wall Pads as manufactured by Draper, Inc.
- B. Pad shape and size: Size and shape to be determined after demolition
  - 1. Flat, rectangular pads: 24" x 60".
- C. Cushioning material: 2 inches.
- D. Backer: 7/16-inch urea-formaldehyde free Oriented Strand Board. Pads that wrap around columns or are curved shall be provided without solid backer.
- E. Cover: Solid vinyl coated polyester fabric with embossed pattern:
  - 1. Weight: 14 ounces per SY.
  - 2. Breaking strength: 350 PSI.

3. Tear resistance: 65 pounds.
  4. Resistant to rot, mildew, and ultraviolet light.
  5. Flammability: Rated self extinguishing in accordance with California State Fire Code F-230.
  6. Color: Blue (to match existing).
- F. UL GREENGUARD Gold Certification: Entire wall pad assembly shall have been submitted to indoor air quality evaluation (IAQ) evaluation in accordance with UL 2811 test method to show compliance with emissions limits on UL 2818 Section 7.1 and 7.2. Materials are tested in accordance with ANSI/BIFMA M7.1-2011 and determined to comply with ANSI/BFMA X7.1-2011 and ANSI/BIFMA e3-2014e credit 7.6.1, 7.6.2 and 7.6.3. Material of emissions of total volatile organic compounds of < 0.22 mg/m<sup>3</sup>, formaldehyde < 0.0135 ppm, total aldehydes < 0.043 ppm, individual volatile organic compounds < 1/1000 TLV and < ½ chronic REL and total phthalates < 0.01 mg/m<sup>3</sup>. Manufacturer must be able to provide independent lab and test reports to verify compliance.
  - G. Fire Rating: Entire pad assembly has been tested and meets the requirements of NFPA 101 Life Safety Code for class A rating (flame spread 0-25 and smoke development 0-450) when tested in accordance with ASTM E-84 (also published as NFPA-255, ANSI 2.5, UBC 8-1 (42-1) and UL 723). Entire pad assembly has been tested and meets the criteria set forth in the 2003 IBC section 803.2.1 when tested in accordance with NFPA 286. NFPA 286 does not publish pass/fail criteria.
  - H. ASTM: Pads shall meet all requirements of ASTM 2440-04. Manufacturer must be able to provide independent lab and test reports to verify compliance.
  - I. Construction: Cushioning material adhered to backer [with liner positioned on top of foam] and panel fully wrapped with fabric which is stapled to backer such that backer is not exposed on front or sides.

\*\*\*\*\* Typically Wall Pads are provided with flanges top and bottom for mounting. As an option, Z mounting clips can be provided at panel top in lieu of top flange. \*\*\*\*\*

- J. Provide 1 inch wide fabric flanges at panel bottom and top.
- K. Attachment: Provide pads without solid backing with hook and loop strips at top of pad.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Field verify dimensions prior to fabrication.
- B. Coordinate fabrication of wall protection pads with size and location of switches, electrical outlets, and other wall mounted items; structural framing and bracing projecting from wall surface; and door and other wall openings.
- C. For pads placed around structural columns coordinate required shapes and sizes with actual dimensions of structural members.

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's written instructions and shop drawings.
- B. Protection mats:
  - 1. Mount protection pads ~4" above finished floor – align with existing.
  - 2. Secure to wall with fasteners along top and bottom. Type, size and spacing of fasteners as recommended by manufacturer.
  - 3. Neatly make cutouts for switches, electrical outlets, and other items on wall and seal with matching vinyl fabric.

END OF SECTION 116623



## SECTION 122124 – MANUAL ROLLER SHADE SYSTEM

### PART 1 – GENERAL

#### 1.1 SECTION INCLUDES

- A. Provide manually operated, sunscreen and blackout roller shades as applicable.
- B. Related Sections:
  - 1. Division 09 - Gypsum Board Assemblies: Coordination with gypsum board assemblies for blocking, installation of shade pockets, closures and related accessories.
  - 2. Division 09 – Acoustical Tile Ceilings: Coordination with acoustical ceiling systems for blocking, installation of shade pockets, closures and related accessories.
  - 3. Division 26 - Electrical: Electric service for EDU's, and EDU controls, internal communication, low voltage wiring and data transfer, and connection to the Internet and required.

#### 1.2 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
  - 3. Storage and handling requirements and recommendations.
  - 4. Mounting details and installation methods.
  - 5. Typical wiring diagrams including integration of EDU controllers with building management system, audiovisual and lighting control systems as applicable.
- B. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.
- C. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shade cloth samples and aluminum finish sample as selected. Mark face of material to indicate interior faces.
- D. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.
- E. Warranty: Provide manufacturer's warranty documents as specified in this Section.

#### 1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain roller shades system through one source from a single manufacturer with a minimum of ten years' experience and minimum of five projects of similar scope and size in manufacturing products comparable to those specified in this

section. This includes but is not limited to all required extrusions, accessories, controls and fabricated roller shades or else all stated and published warranties may be void.

- B. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- C. Shadecloth Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, and ATCC9645.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

#### 1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

#### 1.6 WARRANTY

- A. Warranty: Provide manufacturer's standard warranties, including the following:
  - 1. Roller Shade Hardware, and Shadecloth: Manufacturer's standard non-depreciating twenty-five year limited warranty.
  - 2. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to access to the work above 12' Feet AFF, which are the responsibility of others.

### PART 2 – PRODUCTS

#### 2.1 MANUFACTURER

- A. Basis of Design Manufacturer for Window Shade System: Products by MechoSystems; 42-03 35<sup>th</sup> Street, Long Island City, NY 11101. Tel: (718) 729-2020 ext 1901; Mr. Glen Berman. Email: [glenb@MechoSystems.com](mailto:glenb@MechoSystems.com).

#### 2.2 SHADE BANDS

- A. Shade Bands: Construction of shade band includes the fabric, the enclosed hem weight, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
  - 1. Concealed Hembar: Shall be continuous extruded aluminum for entire width of shade band and with the following characteristics:
    - a. Hembar shall be heat sealed on all sides.
    - b. Open ends shall not be accepted.
  - 2. Shade Band and Shade Roller Attachment:
    - a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection.

- b. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a “snap-on” snap-off” spline mounting, without having to remove shade roller from shade brackets.
- c. Mounting Spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
- d. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets, does not meet the performance requirements of this specification and shall not be accepted.

### 2.3 ROLLER SHADE FABRICATION

- A. Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shade cloth to roll true and straight without shifting sideways more than 1/8 inch in either direction per 8 feet of shade height due to warp distortion or weave design.
- B. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shade bands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer’s standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shade cloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.
- C. For railroaded shade bands, provide seams in railroaded multi-width shade bands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer’s standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroaded multi-width shade bands.
- D. Provide battens for railroaded shades when width-to-height (W:H) ratios meet or exceed manufacturer’s standards. In absence of manufacturer’s standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shade bands.
- E. Blackout shade bands, when used in side channels, shall have horizontally mounted, roll-formed stainless steel or tempered-steel battens not more than 3 feet (115 mm) on center extending fully into the side channels. Battens shall be concealed in an integrally colored fabric to match the inside and outside colors of the shade band, in accordance with manufacturer’s published standards for spacing and requirements.
  - 1. Battens shall be roll formed of stainless steel or tempered steel and concave to match the contour of the roller tube.

### 2.4 ROLLER SHADE COMPONENTS

- A. Access and Material Requirements:
  - 1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
  - 2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.

3. Use only Delran engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester shall not be accepted.

B. Manual Operated Chain Drive Hardware and Brackets:

1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable.
7. Provide shade hardware constructed of minimum 1/8-inch thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
8. Drive Bracket / Brake Assembly:
  - a. MechoShade Drive Bracket model M5 shall be fully integrated with all MechoShade accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
  - b. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch steel pin.
  - c. The brake shall be an over running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. in the stopped position.
  - d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.

- e. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.
9. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. minimum breaking strength. Nickel plate chain shall not be accepted.

## 2.5 SHADECLOTH

- A. Visually Transparent Single-Fabric Shadecloth: MechoSystems, ThermoVeil® group, single thickness, opaque non-raveling 0.030-inch thick vinyl fabric, woven from 0.018-inch diameter extruded vinyl yarn comprising of 21 percent polyester and 79 percent reinforced vinyl, in colors selected from manufacturer's available range.
  - 1. Dense Linear Weave: "1000 series", 3 percent open, dense linear-weave pattern.
  - 2. Color: Selected from manufacturer's standard colors.

## 2.6 ROLLER SHADE ACCESSORIES

- A. Shade Pocket: For recessed mounting in acoustical tile or drywall ceilings as indicated on the drawings.
  - 1. Either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.
- B. Fascia:
  - 1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
  - 2. Fascia shall be able to be installed across two or more shade bands in one piece.
  - 3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
  - 4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### 3.3 INSTALLATION OF ROLLER SHADES

- A. Contractor Furnish and Install Responsibilities:

1. Window Covering Contractor (WC) shall provide an on site, Project Manager, and shall be present for all related jobsite scheduling meetings.
2. WC shall supervise the roller shade installation, and setting of intermediate stops of all shades to assure the alignment of the shade bands within a single EDU group, which shall not exceed +/- 0.125 inches and to assure the alignment between EDU groups, which shall not exceed +/- 0.25 inches.
3. WC shall be responsible for field inspection on an area-by- area and floor-by-floor basis during construction to confirm proper mounting conditions per approved shop drawings.
4. Verification of Conditions: examine the areas to receive the work and the conditions under which the work would be performed and notify General Contractor and Owner of conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected. Commencement of installation shall constitute acceptance of substrate conditions by the installer.
5. WC shall provide accurate to 0.0625 inch; field measurements for custom shade fabrication on the Roller Shades manufacturers input forms.
6. WC Installer shall install roller shades level, plumb, square, and true according to manufacturer's written instructions, and as specified here in. Blocking for roller shades installed under the contract of the interior General Contractor shall be installed plumb, level, and fitted to window mullion as per interior architect's design documents and in accordance with industry standard tolerances. The horizontal surface of the shade pocket shall not be out-of-level more than 0.625 inch over 20 linear feet.
7. Shades shall be located so the shade band is not closer than 2 inches to the interior face of the glass. Allow proper clearances for window operation hardware.
8. Adjust, align and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
9. Installer shall set Upper, Lower and up to 3 intermediate stop positions of all motorized shade bands and assure alignment in accordance with the above requirements.
10. WC shall certify the operation of all motorized shades and turn over each floor for preliminary acceptance.
11. The WC shall participate and cooperate with the electrical contractor, the window shade manufacturer and the Commissioning agent to verify and certify the installation is in full conformance with the specifications and is fully operational. This work to occur during the commissioning stage and is in addition to preliminary acceptance required for each floor.
12. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
13. WC shall train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.
14. Protect installed products until completion of project.
15. Touch-up, repair or replace damaged products before Substantial Completion.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 122124



## SECTION 123554 – MANUFACTURED CASEWORK

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Plastic Laminate Casework
- B. Countertops (see separate specification for solid surface)

#### 1.2 RELATED SECTIONS

- A. Section 061000 - Rough Carpentry: Framing and blocking in walls, floors and ceiling to support equipment.

#### 1.3 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Indicate locations of blocking and reinforcements required for installing casework.
  - 2. Indicate locations and types of service fittings, together with associated service supply connection required.
  - 3. Include details of utility spaces.
  - 4. Include indicators of exposed conduits, if required, for service fittings.
  - 5. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
  - 6. Include coordinated dimensions for laboratory equipment specified in other Sections.
- C. Certificate of Origin: Manufacturer must supply with first submittal, an example of their Certificate of Origin declaring casework is wholly manufactured and assembled specifically in the United States, including city, county, and state locations. A notarized Certificate of Origin must be provided with closeout documents.
- D. Selection Samples: For each finish product specified, one complete set of color chips representing manufacturer's full range of available colors and patterns.
  - 1. One set of samples indicating full range of finishes for countertop specified.
  - 2. One set of casework samples indicating full range of finishes for casework specified.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Not less than 5 years experience in the actual production of specified products. Casework shall be wholly manufactured and assembled in the USA: i.e. "American Made".
- B. Installer Qualifications: Firm with 5 years experience in installation or application of systems similar in complexity to those required for this Project, plus the following.
  - 1. Authorized distributor of manufacturer.
- C. Mock-Up: Provide a mock-up for evaluation of fabrication techniques and application workmanship. To be provided 7 days in advance of bid for manufactures seeking consideration.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until project conditions are ready for installation.

## 1.6 PROJECT CONDITIONS

- A. For delivery and installation of laboratory casework and equipment, building conditions shall comply with AWI Standard 1700-G-3 and 1700-G-4 and be as follows:
  - 1. Flooring required to be placed under casework and equipment installed.
  - 2. Wood or metal blocking (wall grounds) installed within partitions to allow for immediate installation upon delivery.
  - 3. Heating and air conditioning systems providing consistent temperature and humidity conditions to comply with by AWI Standard 1700-G-4 and 1700-G-5.
  - 4. Relative humidity not less than 40 percent, nor more than 60 percent.
  - 5. Temperatures not less than 65 degrees F (18 degrees C) and not greater than 80 degrees F (27 degrees C) in areas of casework and equipment installation.
  - 6. Overhead mechanical, electrical and plumbing rough-in work is complete.
  - 7. Wet operations complete prior to delivery.
  - 8. Ceiling grids (with or without ceiling tiles), overhead soffits, ductwork and lighting installed.
  - 9. Painting complete.

## 1.7 WARRANTY

- A. Casework Manufacturer Warranty: 3 years from date of delivery. Warranty is for the conditions indicated below, and when notified in writing from Owner, manufacturer shall promptly investigate, and address said deficiencies.
  - 1. Defects in materials and workmanship.
  - 2. Deterioration of material and surface performance below minimum SEFA 8 standards as certified by independent third-party testing laboratory.
  - 3. Within the warranty period, we shall, at our option, repair, replace, or refund the purchase price of defective casework.
- B. Casework manufacturer shall be notified immediately of defective products and be given a reasonable opportunity to inspect the goods prior to return. Casework manufacturer will not assume responsibility, or compensation, for unauthorized repairs or labor. Casework manufacturer makes no other warranty, expressed or implied, to the merchantability, fitness for a particular purpose, design, sale, installation, or use, of casework; and, shall not be liable for incidental or consequential damages, losses of or expenses, resulting from the use of their products.
  - 1. The warranty with respect to products from another company sold by the casework manufacturer is limited to the warranty extended by that other company.
- C. Casework manufacturer shall provide, with close-out documents, a Certificate of Warranty for products provided.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Case Systems, 2700 James Savage Road, Midland, Michigan 48642 (989) 496-9510 and/or approved dealers.

B. Preapproved Acceptable Manufacturers: TMI Systems

C. Substitution Limitations:

1. Substitutions will be considered only when other manufacturers submit substitution requests in accordance with procurement substitution and/or substitution procedures, or provide a comparable product with the following support information detailed below:
  - a. Written documentation stating specification compliance regarding construction, materials, and standard of quality and manufacturing techniques.
  - b. Note all deviations to the drawings and/or specifications in writing.
  - c. The owner, or its designated representative, reserves the right to reject any proposal that in his opinion fails to meet the criteria established by this specification. Such a decision shall be final.

## 2.2 CONSTRUCTION

A. Plastic laminate on particleboard core: Casework.

B. Cabinet Finish, Interiors and Exteriors Match Finished:

1. Plastic laminate. Refer to Finish Schedule and drawings for plastic laminate types and locations. (Thermofuse cabinet interiors & exteriors are NOT to be provided)

C. Drawer and Door Styles:

1. Drawer and Door Styling: Doors and drawers are 3/4 inch thick and have a particleboard core with plastic laminate face and back with 1/8 inch PVC edge-band.

D. Door and Drawer Hardware Style:

1. Drawer Slides:
  - a. Drawer Epoxy powder coated, cold rolled steel, heavy-duty with a 100 lbs (45 kilograms) load capacity. They are equipped with heavy-duty, nylon rollers for smooth effortless operation. Slides have automatic positive stop to prevent drawer's accidental removal but allow for quick removal without tools.

## 2.3 MATERIALS

A. Hardboard used in drawer bottoms and unexposed backs, consists of super-refined wood fibers and chips, highly compressed into a hard, dense, 1/4 inch thick, homogeneous sheet, faced with wood grain pattern melamine on the exposed face. Physical properties: Average MOR is 5,000 lbs/sq inches; density is 48 lbs/cu ft; and MOE of 500,000 psi. All hardboard shall be CARB Phase 1 compliant.

B. Particleboard is industrial grade, with the following physical properties: Density, 48 lb/cu. ft. (0.6 kg/cu m); minimum modulus of rupture 2,200 psi; minimum modulus of elasticity 450,000 psi. All particleboard shall be CARB Phase 1 compliant.

C. High-pressure plastic laminate, regular grade, is melamine impregnated decorative surface papers, superimposed over kraft phenolic core sheets, vertical grade, high pressure, plastic laminate has a nominal thickness of 0.030 inch complying with NEMA LD 3.

1. Exposed interior and exposed exterior surfaces.

D. Low-pressure plastic laminate are panels of melamine resin impregnated decorative paper, thermally fused to industrial grade particleboard or to service tempered hardboard. Thermal fusion under heat and pressure, permanently bonds the resin-impregnated paper to the substrate and produces a permanent bond between the melamine surface and the substrate. Low-pressure plastic laminate is frosty white in color. Low-pressure plastic laminated to

hardboard is used as drawer bottoms and unexposed interior backs.

1. Unexposed and concealed interior and unexposed exterior.

## 2.4 FABRICATION

- A. Cabinets have a 1 inch by 4 inches, low-pressure plastic laminate on particleboard core horizontal front and back top frame member, with black PVC edge-band on front member. Front intermediate rail is 10-5/8 inches by 3/4 inch, low-pressure plastic laminate on particleboard core. Exposed exterior backs are high-pressure plastic laminated 3/4 inch particleboard. Cabinets with exposed interiors but unexposed exteriors have 3/4 inch particleboard, and the unexposed surface is laminated with low-pressure plastic laminate. Cabinets with unexposed interiors and exteriors have faces of low-pressure plastic laminated 1/4 inch hardboard. Exposed interior or exterior end panels are high-pressure plastic laminated 3/4 inch particleboard. Unexposed interior or exterior end panels are low-pressure plastic laminated 3/4 inch particleboard. Bottom, shelves, and dividers in cabinets with exposed interiors are high-pressure plastic laminated 3/4 inch particleboard; with unexposed interiors is low-pressure plastic laminated 3/4 inch particleboard. Exposed edges of end panels, bottom, shelves and dividers are edged with black PVC, applied after lamination. Color coordinated PVC must be specified, Drawer separators, furnished only when specified, are full depth, 3/4 inch, and low-pressure plastic laminate on particleboard core.
- B. Cabinet construction is bored, doweled, dadoed, glued and screwed construction. Cabinets are enclosed without the use of common partitions. A full horizontal, mortise, tenon and glued, top frame is bored, doweled, glued, and reinforced with six (6) screws into the cabinet. Intermediate front rails and bottom rear horizontal parting rails are provided as required. Separators, where specified, are let into routed intermediate rails. Backs are recessed and encapsulated into dadoed end panels then screwed into the top and bottom case members. A standard enclosed toe space, 2-1/4 inches by 4 inches high, is provided, with toe rail bored, doweled and glued to end panels; however, casework cabinets, when in a library assembly such as a circulation desk, will have an enclosed toe space 2-1/4 inches deep by 6 inches high. Shelves are supported on heavy-duty, laboratory grade, twin pin plastic shelf clips, which fit into two double rows of holes drilled 1-1/4 inches on centers, in the case end panels for maximum shelf adjustability.
- C. Construction - Wall and Upper Cases: Wall and upper cases have components that are laminate on particleboard core. Adjustable shelves are 1 inch thick particleboard with laminate faces and appropriate edging. Backs, in cases with exposed interiors and exposed exteriors are 1/4 inch thick hardboard with melamine face. Backs in cases with unexposed interiors and unexposed exteriors are 1/4 inch hardboard with melamine face. Exterior back cross rails: 4 inches by 3/4 inch hardwood plywood.
- D. Construction - Tall Cases: Top panels in tall cases with exposed interiors are 1 inch hardwood plywood; tall cases with unexposed interiors have top panels of 1 inch plywood. Bottom panels in tall cases with exposed interiors are 3/4 inch hardwood plywood; and unexposed interiors have 3/4 inch plywood. Interiors, whether exposed or unexposed, are stain color matched to the exterior finish. Adjustable shelves are 1 inch thick hardwood plywood if exposed; 1 inch plywood if unexposed. Shelves are edged with 1/8 inch solid hardwood edging. Backs in tall cases with exposed interiors and exposed exteriors, are 1/4 inch hardwood plywood. Tall cases with unexposed interior or exterior backs have 1/4 inch hardboard melamine color stain matched to the interior. End panels in tall cases with exposed end panels have 3/4 inch hardwood plywood. End panels in cases with unexposed end panels have 3/4 inch plywood. All exposed edges of hardwood plywood components and plywood components are edged with 1/8 inch solid hardwood edging. Tall cases have two exterior hardwood plywood cross rails, 4 inches by 3/4 inch. Tall cases are rigidly constructed, integral units with the strongest, most advanced joinery methods utilized of

bored, doweled, dadoed, glued and screwed construction. Each case is completely enclosed without the use of common partitions and has flush construction with overlapping doors to provide a dust resistant interior. The top panel is bored, doweled and glued into end panels; and the bottom panel is bored, doweled and glued into end panels and glued and screwed to the back. Additional back cross rails are provided as required. Backs are recessed and encapsulated into dadoed end panels and screwed to the top and bottom tall case members. An enclosed toe space 2-1/4 inch by 4 inches is provided with toe rail securely bored, doweled and glued to end panels and bottom panel. Adjustable shelves are supported on heavy-duty laboratory grade, twin pin plastic shelf clips, which fit into two rows of holes drilled 1-1/4 inches on centers in the end panels, for maximum shelf adjustability.

## 2.5 CABINET HARDWARE

- A. Provide I casework manufacturer's standard finish, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.
- B. Hinges to be selected from manufacturers standard
- C. Pulls are wire design: stainless steel
- D. Locks on all cabinet doors and drawer to be 5 disc type with master keys
- E. Friction roller or magnetic catch is zinc plated steel catch with a spring cushioned; polyethylene roller, and a metal strike plate. Screw mounted catches and strike plate have slotted holes for adjustability.
- F. Shelf clips are made from clear polycarbonate. Clips have double, 3/16 inch diameter pins and are equipped with shelf lock hold down tabs for 3/4 inch or 1 inch thick shelves.

## 2.6 COUNTER TOPS - Solid Surface countertops and backsplash - see specification section

# PART 3 EXECUTION

## 3.1 INSTALLATION

- A. Install casework in accordance with manufacturer's instructions.
  - 1. Installation of casework shall be plumb, level, true and straight, with no distortions.
  - 2. Use concealed shims as required.
  - 3. Where laboratory casework or equipment butts against other finished work, scribe and cut for an accurate fit.
  - 4. Lubricate operating hardware as recommended by the manufacturer.
- B. Install countertop and edge surfaces in one plane with flush hairline seams. Locate seams where shown on Shop Drawings.
  - 1. Provide required holes and cutouts for sinks as shown on Shop Drawings.
  - 2. Seal unfinished edges and cutouts in plastic-laminate countertops.
  - 3. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Coordination with Mechanical, Plumbing and Electrical Contractors.
- D. Touch-up, repair replace damaged products before Substantial Completion.

END OF SECTION 123554



## SECTION 124813 - ENTRANCE FLOOR MATS AND FRAMES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Roll-up rail mats.
  - 2. Recessed frames.

#### 1.3 COORDINATION

- A. Coordinate size and location of recesses in concrete to receive floor mats and frames.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for floor mats and frames.
- B. Shop Drawings:
  - 1. Items penetrating floor mats and frames, including door control devices.
  - 2. Divisions between mat sections.
  - 3. Perimeter floor moldings.
  - 4. Custom Graphics: Scale drawing indicating colors.
- C. Samples: For the following products, in manufacturer's standard sizes:
  - 1. Floor Mat: Assembled sections of floor mat.
  - 2. Tread Rail: Sample of each type and color.
  - 3. Frame Members: Sample of each type and color.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For floor mats and frames to include in maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 ENTRANCE FLOOR MATS AND FRAMES, GENERAL

- A. Structural Performance: Provide roll-up rail mats and frames capable of withstanding the following loads and stresses within limits and under conditions indicated:
  - 1. Uniform floor load of 300 lbf/sq. ft.
  - 2. Wheel load of 350 lb. per wheel.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1.

### 2.2 ROLL-UP RAIL MATS

- A. Roll-up, Aluminum-Rail Hinged Mats: Extruded-aluminum tread rails 1-1/2 inches wide by 3/8 inch thick, sitting on continuous vinyl cushions.
  - 1. Tread Inserts: 1/4-inch- high, 28-oz./sq. yd. weight, level-cut, nylon-pile, fusion-bonded carpet.
  - 2. Colors, Textures, and Patterns of Inserts: As selected by Architect from full range of industry colors.
  - 3. Rail Color: Mill finish.
  - 4. Hinges: Aluminum.
  - 5. Mat Size: As indicated.

### 2.3 FRAMES

- A. Recessed Frames: Manufacturer's standard extrusion.
  - 1. Extruded Aluminum: ASTM B 221, Alloy 6061-T6 or Alloy 6063-T5, T6, or T52.
    - a. Color: Mill finish.

### 2.4 CONCRETE FILL AND GROUT MATERIALS

- A. Provide concrete fill and grout equivalent in strength to cast-in-place concrete slabs for recessed mats and frames. Use aggregate no larger than one-third fill thickness.

### 2.5 FABRICATION

- A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.

- B. Surface-Mounted Frames: As indicated for permanent surface-mounted installation, complete with corner connectors, splice plates or connecting pins, and post-installed expansion anchors.
- C. Recessed Frames: As indicated, for permanent recessed installation, complete with corner pins or reinforcement and anchorage devices.
  - 1. Fabricate edge-frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.
- D. Coat concealed surfaces of aluminum frames that contact cementitious material with manufacturer's standard protective coating.

## 2.6 ALUMINUM FINISHES

- A. Mill finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install recessed mat frames to comply with manufacturer's written instructions. Set mat tops at height recommended by manufacturer for most effective cleaning action; coordinate tops of mat surfaces with bottoms of doors that swing across mats to provide clearance between door and mat.
  - 1. 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.

### 3.3 PROTECTION

- A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 124813



## SECTION 220000 – PLUMBING SUMMARY OF WORK

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 22, and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - a. Work covered under Plumbing contract.
  - b. Work under other contracts.
  - c. Use of premises.
  - d. Owner's occupancy requirements.
  - e. Specification formats and conventions.

- B. Related Sections include the following:

- a. Division 22 Sections.

#### 1.3 WORK COVERED UNDER PLUMBING CONTRACT

- A. Provide all labor, materials, tools, machinery, equipment, and services necessary to complete the plumbing work under this contract. All systems and equipment shall be complete in every respect and all items of material, equipment, and labor shall be provided for a fully operational system. Coordinate the work with work of other trades so as to resolve conflicts without impeding job progress. The plumbing work includes the following:

- B. PLUMBING:

- 1. Remove existing plumbing fixtures as indicated on plans, complete with all associated flushometers, faucets, piping, valves, cleanouts, traps, fittings, supports, etc.
  - 2. Remove existing domestic water piping (DCW/DHW/DHWR) as called out on the drawings, complete with existing valves, insulation, supports, etc.
  - 3. Remove existing plumbing piping (waste, vent, gas, vacuum, etc.) as called out on the drawings, complete with existing valves, supports, etc.
  - 4. Remove all demolished equipment and debris from the site in accordance with all State and Local regulations.
  - 5. Coordinate all removals as further scheduled on the drawings so as not to interfere with Owner's use of the building.
  - 6. Furnish and install new plumbing fixtures, faucets, piping, valves, strainers, cleanouts, accessories, etc. as specified on plans and in the specifications.

7. Furnish and install new domestic hot water heater, complete with new piping, flue vent & air intake pipe, domestic hot water mixing valve, valves, expansion tank, controls, fittings, etc. as indicated on plans.
8. Furnish and install new grease interceptor, complete with new piping, air fitting, etc. as indicated on plans. Sawcut existing floor slab as required and patch.
9. Furnish and install new domestic water piping (DCW/DHW/DHWR) as indicated on the plans, complete with valves, fittings, hangers, supports, insulation, etc. Connect to existing piping. Coordinate all tie-in connections in field.
10. Furnish and install new waste and vent piping, complete with cleanouts, fittings, hangers and supports. Saw cut existing floor slabs, ceiling, walls and roof as required and patch. Coordinate all slopes and inverts and tie-in connections in field
11. Furnish and install new roof leader/storm piping, complete with cleanouts, fittings, hangers and supports.
12. Furnish and install new gas piping to new HVAC/HV/mechanical equipment, kitchen appliances, domestic hot water heater, etc. as indicated on plans. Coordinate with the local utility company for upgrading of existing gas service and pay for all costs. Provide gas shut off valves and gas pressure regulators as called out on plans. All new gas piping shall be painted with "yellow" color (1 primer and 2 finish coats)
13. Furnish and install new elevator sump pump system with simplex pump, control panel, controls, etc. for a complete and operational system.
14. Furnish and install new condensate drain piping for new HVAC equipment as shown on the drawings, complete with new condensate drain pumps, dry wells, supports, pipe insulation, pipe identifications and flow arrows.
15. Furnish and install new roof drains and associated piping as shown on the drawings.
16. Furnish and install new floor drains, floor sinks, and related piping, and traps.
17. Provide insulation to all domestic water piping (DCW/DHW/DHWR) and roof leader/storm piping. Refer to specification section 220719 for insulation requirements.
18. Provide proper piping supports, hangers, anchors, etc.
19. Provide proper slope to all piping as per latest Plumbing Code and other applicable codes.
20. Pressure-test all piping for any leakage. Repair all leaks and perform testing until no leaks are found.
21. Provide identification tags with flow arrows for all plumbing piping. Provide valve tags for all valves and provide a valve chart identifying all valve sizes and locations.
22. Furnish and install all ancillary equipment needed for a complete and proper installation including, but not limited to expansion joints, anchors, hangers, fittings, valves, unions, etc.
23. All cutting, patching and alteration work shall be performed.

24. The contractor shall furnish and install all items required for a complete and functioning plumbing system.

#### 1.4 WORK UNDER OTHER CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

#### 1.5 USE OF PREMISES

- A. General: Each Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - a. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public.
  - b. Driveways and Entrances: Keep driveways parking garage, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of Existing Building: Maintain existing building in a weather tight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

#### 1.6 OWNER'S OCCUPANCY REQUIREMENTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits, unless otherwise indicated.
  - a. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
  - b. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.

- a. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
- b. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
- c. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed.

## 1.7 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the CSI/CSC's "MasterFormat" numbering system.
  - a. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
  - b. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - a. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
  - b. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

## 1.8 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 220000

## SECTION 220501 - BASIC PLUMBING MATERIALS AND METHODS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Transition fittings.
  - 3. Dielectric fittings.
  - 4. Mechanical sleeve seals.
  - 5. Sleeves.
  - 6. Escutcheons.
  - 7. Grout.
  - 8. Mechanical demolition.
  - 9. Equipment installation requirements common to equipment sections.
  - 10. Painting and finishing.
  - 11. Concrete bases.
  - 12. Supports and anchorages.

#### 1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for rubber materials:
  - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.

2. NBR: Acrylonitrile-butadiene rubber.

#### 1.4 SUBMITTALS

- A. Product Data: For the following:
  1. Transition fittings.
  2. Dielectric fittings.
  3. Mechanical sleeve seals.
  4. Escutcheons.
- B. Welding certificates.

#### 1.5 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
  1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
  2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

#### 1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### 2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

### 2.3 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

## 2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
  - 1. Manufacturers:
    - a. Eclipse, Inc.
    - b. Epco Sales, Inc.
    - c. Watts Industries, Inc.; Water Products Div.
    - d. Zurn Industries, Inc.; Wilkins Div.
    - e. Or Approved Equal
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
  - 1. Manufacturers:
    - a. Capitol Manufacturing Co.
    - b. Epco Sales, Inc.
    - c. Watts Industries, Inc.; Water Products Div.
    - d. Or Approved Equal
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
  - 1. Manufacturers:
    - a. Calpico, Inc.
    - b. Pipeline Seal and Insulator, Inc.
    - c. Or Approved Equal
  - 2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
  - 1. Manufacturers:
    - a. Calpico, Inc.
    - b. Lochinvar Corp.
    - c. Or Approved Equal
- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
  - 1. Manufacturers:

- a. Perfection Corp.
- b. Precision Plumbing Products, Inc.
- c. Sioux Chief Manufacturing Co., Inc.
- d. Or Approved Equal

## 2.5 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
  - 1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
    - e. Or Approved Equal
  - 2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 3. Pressure Plates: Carbon steel or Stainless steel. Include two for each sealing element.
  - 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating or Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## 2.6 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
  - 1. Underdeck Clamp: Clamping ring with set screws.

## 2.7 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece/Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.
- D. One-Piece/Split-Plate, Stamped-Steel Type: With concealed or exposed-rivet hinge, set screw or spring clips, and chrome-plated finish.
- E. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- F. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

## 2.8 GROUT

- A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.
  1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  2. Design Mix: 5000-psi, 28-day compressive strength.
  3. Packaging: Premixed and factory packaged.

## PART 3 - EXECUTION

### 3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.

- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
  - 1. New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    - f. Bare Piping at Ceiling Penetrations in Finished Spaces: Cast-brass type with polished chrome-plated finish.
    - g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - h. Bare Piping in Equipment Rooms: One-piece, cast-brass type or One-piece, stamped steel type.
    - i. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
- M. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).
    - b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.
  - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.
- O. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.

2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
  3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- P. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.
- R. Verify final equipment locations for roughing-in.
- S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

### 3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### 3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

### 3.5 PAINTING

- A. Painting of mechanical systems, equipment, and components is specified.
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### 3.6 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
  - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
  - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.

3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 4000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

### 3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1.

### 3.8 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

### 3.9 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout around anchors.
- G. Cure placed grout.

END OF SECTION 220501

## SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Liquid-in-glass thermometers.
3. Thermowells.
4. Dial-type pressure gages.
5. Gage attachments.
6. Test plugs.

- B. Related Sections:

1. Section 221116 "Domestic Water Piping" for water meters inside the building.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of meter and gage, from manufacturer.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

### PART 2 - PRODUCTS

#### 2.1 BIMETALLIC-ACTUATED THERMOMETERS

- A. Manufacturers:

1. Palmer Wahl Instruments Inc.

2. H.O. Trerice Co.
  3. Weiss Instruments, Inc.
  4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
  5. Or Approved Equal.
- B. Standard: ASME B40.200.
- C. Case: Liquid-filled and sealed type(s); stainless steel with 5-inch nominal diameter.
- D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg. F.
- E. Connector Type(s): Union joint, adjustable angle or rigid, with unified-inch screw threads.
- F. Connector Size: 1/2 inch with ASME B1.1 screw threads.
- G. Stem: 0.25 or 0.375 inch in diameter; stainless steel.
- H. Window: Plain glass.
- I. Ring: Stainless steel.
- J. Element: Bimetal coil.
- K. Pointer: Dark-colored metal.
- L. Accuracy: Plus or minus 1 percent of scale range.

## 2.2 LIQUID-IN-GLASS THERMOMETERS

- A. Manufacturers:
1. Palmer Wahl Instruments Inc.
  2. H.O. Trerice Co.
  3. Weiss Instruments, Inc.
  4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
  5. Or Approved Equal.
- B. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:
1. Standard: ASME B40.200.
  2. Case: Cast aluminum, 6-inch nominal size.
  3. Case Form: Back angle or Straight unless otherwise indicated.
  4. Tube: Glass with magnifying lens and blue [or red] organic liquid.
  5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg. F.
  6. Window: Glass or plastic.
  7. Stem: Aluminum or brass and of length to suit installation.
    - a. Design for Thermowell Installation: Bare stem.
  8. Connector: 3/4 inch, with ASME B1.1 screw threads.

9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

C. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Standard: ASME B40.200.
2. Case: Cast aluminum, 9-inch (229-mm) nominal size unless otherwise indicated.
3. Case Form: Adjustable angle, Back angle or Straight unless otherwise indicated.
4. Tube: Glass with magnifying lens and blue or red organic liquid.
5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg. F.
6. Window: Glass.
7. Stem: Aluminum and of length to suit installation.
  - a. Design for Thermowell Installation: Bare stem.
8. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

## 2.3 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: [CNR] [or] [CUNI] <Insert material>.
4. Material for Use with Steel Piping: [CRES] [CSA] <Insert material>.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch (13, 19, and 25 mm), with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

## 2.4 PRESSURE GAGES

A. Manufacturers:

1. Palmer Wahl Instruments Inc.
2. H.O. Trerice Co.
3. Weiss Instruments, Inc.
4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.
5. Or Approved Equal.

- B. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
1. Standard: ASME B40.100.
  2. Case: [Liquid-filled] [Sealed] [Open-front, pressure relief] [Solid-front, pressure relief] type(s); cast aluminum; 4-1/2-inch nominal diameter.
  3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
  4. Pressure Connection: Brass, with [NPS 1/4 (DN 8)] [NPS 1/4 or NPS 1/2 (DN 8 or DN 15)] [NPS 1/2 (DN 15)], ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
  5. Movement: Mechanical, with link to pressure element and connection to pointer.
  6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
  7. Pointer: Dark-colored metal.
  8. Window: Glass.
  9. Ring: Stainless steel.
  10. Accuracy: Grade A, plus or minus 1 percent of middle half of.

C. Remote-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Standard: ASME B40.100.
2. Case: Liquid-filled, Sealed type; cast aluminum; 4-1/2-inch nominal diameter with [back] [front] flange and holes for panel mounting.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, with [NPS 1/4 (DN 8)] [NPS 1/4 or NPS 1/2 (DN 8 or DN 15)] [NPS 1/2 (DN 15)], ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Stainless steel.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of.

## 2.5 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with [NPS 1/4 (DN 8)] [NPS 1/4 or NPS 1/2 (DN 8 or DN 15)] [NPS 1/2 (DN 15)], ASME B1.20.1 pipe threads and [piston] [porous-metal]-type surge-dampening device. Include extension for use on insulated piping.
- B. Valves: Brass or stainless-steel needle, with [NPS 1/4 (DN 8)] [NPS 1/4 or NPS 1/2 (DN 8 or DN 15)] [NPS 1/2 (DN 15)], ASME B1.20.1 pipe threads.

## 2.6 TEST PLUGS

- A. Description: Test-station fitting made for insertion into piping tee fitting.
- B. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.
- C. Thread Size: [NPS 1/4 (DN 8)] [or] [NPS 1/2 (DN 15)], ASME B1.20.1 pipe thread.
- D. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

- E. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install thermowells with socket extending a minimum of 2 inches into fluid and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.
- G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- H. Install remote-mounted pressure gages on panel.
- I. Install valve and snubber in piping for each pressure gage for fluids.
- J. Install test plugs in piping tees.
- K. Install thermometers in the following locations:
  - 1. Inlet and outlet of each water heater.
- L. Install pressure gages in the following locations:
  - 1. Suction and discharge of each domestic water pump.

### 3.2 CONNECTIONS

- A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

### 3.3 ADJUSTING

- A. Adjust faces of meters and gages to proper angle for best visibility.

### 3.4 THERMOMETER SCHEDULE

- A. Thermometers at inlet and outlet of each domestic water heater shall be one of the following:
  - 1. Liquid-filled or Sealed, bimetallic-actuated type.
  - 2. Industrial]-style, liquid-in-glass type.
  - 3. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.
- B. Thermometer stems shall be of length to match thermowell insertion length.

### 3.5 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.
- B. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F.
- C. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be one of the following:
  - 1. Liquid-filled, Sealed, direct-mounted, metal case.
  - 2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.
- D. Pressure gages at suction and discharge of each domestic water pump shall be one of the following:
  - 1. Liquid-filled, Sealed, direct-mounted, metal case.
  - 2. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

### 3.6 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Water Service Piping: 0 to 200 psi.
- B. Scale Range for Domestic Water Piping: 0 to 200 psi.

END OF SECTION 220519

## SECTION 220523 – PLUMBING VALVES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following general-duty valves (Lead Free Type):
  1. Copper-alloy ball valves.
  2. Ferrous-alloy ball valves.
  3. Bronze check valves.
  4. Ferrous-alloy wafer check valves.
  5. Spring-loaded, lift-disc check valves.
  6. Bronze globe valves.
- B. Related Sections include the following:
  1. Division 22 Section for valve tags and charts.
  2. Division 22 piping Sections for specialty valves applicable to those Sections only.
- C. All valves and fittings for potable water system shall be lead-free type in compliance with requirements of NSF/ANSI Standard 61.

#### 1.3 DEFINITIONS

- A. The following are standard abbreviations for valves:
  1. CWP: Cold working pressure.
  2. EPDM: Ethylene-propylene-diene terpolymer rubber.
  3. NBR: Acrylonitrile-butadiene rubber.
  4. PTFE: Polytetrafluoroethylene plastic.
  5. SWP: Steam working pressure.
  6. TFE: Tetrafluoroethylene plastic.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

## 1.5 QUALITY ASSURANCE

- A. ASME Compliance: ASME B31.1 for power piping valves and ASME B31.9 for building services piping valves.
  - 1. Exceptions: Domestic hot- and cold-water piping valves unless referenced.
- B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.
- C. NSF Compliance: NSF 61 for valve materials for potable-water service.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set valves closed to prevent rattling.
  - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
  - 5. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use hand-wheels or stems as lifting or rigging points.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### 2.2 VALVES, GENERAL

- A. Refer to Part 3 "Valve Applications" Article for applications of valves.

- B. Bronze/Brass Valves: NPS 2 (DN 50) and smaller with threaded ends, unless otherwise indicated.
- C. Ferrous Valves: NPS 2-1/2 (DN 65) and larger with flanged ends, unless otherwise indicated.
- D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.
- F. Valve Actuators:
  - 1. Chain wheel: For attachment to valves, of size and mounting height, as indicated in the "Valve Installation" Article in Part 3.
  - 2. Gear Drive: For quarter-turn valves NPS 8 (DN 200) and larger.
  - 3. Hand wheel: For valves other than quarter-turn types.
  - 4. Lever Handle: For quarter-turn valves NPS 6 (DN 150) and smaller, except plug valves.
  - 5. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug head.
- G. Extended Valve Stems: On insulated valves.
- H. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.
- I. Valve Bypass and Drain Connections: MSS SP-45.

## 2.3 COPPER-ALLOY BALL VALVES

- A. Available Manufacturers:
- B. Manufacturers:
  - 1. One-Piece, Copper-Alloy Ball Valves:
    - a. American Valve, Inc.
    - b. Conbraco Industries, Inc.; Apollo Div.
    - c. Grinnell Corporation.
    - d. Kitz Corporation of America.
    - e. Legend Valve & Fitting, Inc.
    - f. NIBCO INC.
    - g. Watts Industries, Inc.; Water Products Div.
    - h. Or Approved Equal.
- C. Copper-Alloy Ball Valves, General: MSS SP-110, full port type.
- D. One-Piece, Copper-Alloy Ball Valves: Brass or bronze body with chrome-plated bronze ball, PTFE or TFE seats, full port type.

## 2.4 FERROUS-ALLOY BALL VALVES

- A. Available Manufacturers:
- B. Manufacturers:
  - 1. American Valve, Inc.
  - 2. Conbraco Industries, Inc.; Apollo Div.
  - 3. Cooper Cameron Corp.; Cooper Cameron Valves Div.
  - 4. Flow-Tek, Inc.
  - 5. Hammond Valve.
  - 6. Kitz Corporation of America.
  - 7. KTM Products, Inc.
  - 8. Milwaukee Valve Company.
  - 9. NIBCO INC.
  - 10. Richards Industries; Marwin Ball Valves.
  - 11. Or Approved Equal.
- C. Ferrous-Alloy Ball Valves, General: MSS SP-72, with flanged ends, full port.
- D. Ferrous-Alloy Ball Valves: Class 150, full port.

## 2.5 BRONZE CHECK VALVES

- A. Available Manufacturers:
- B. Manufacturers:
  - 1. Type 1, Bronze, Horizontal Lift Check Valves with Metal Disc:
    - a. Cincinnati Valve Co.
    - b. Red-White Valve Corp.
    - c. Walworth Co.
    - d. Or Approved Equal.
  - 2. Type 1, Bronze, Vertical Lift Check Valves with Metal Disc:
    - a. Cincinnati Valve Co.
    - b. Red-White Valve Corp.
    - c. NIBCO INC.
    - d. Or Approved Equal.
  - 3. Type 3, Bronze, Swing Check Valves with Metal Disc:
    - a. American Valve, Inc.
    - b. Cincinnati Valve Co.
    - c. Grinnell Corporation.
    - d. Hammond Valve.
    - e. Kitz Corporation of America.
    - f. Legend Valve & Fitting, Inc.
    - g. Milwaukee Valve Company.
    - h. NIBCO INC.

- i. Powell, Wm. Co.
- j. Red-White Valve Corp.
- k. Walworth Co.
- l. Watts Industries, Inc.; Water Products Div.
- m. Or Approved Equal.

- C. Bronze Check Valves, General: MSS SP-80.
- D. Type 1, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.
- E. Type 1, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.
- F. Type 3, Class 150, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.

## 2.6 FERROUS-ALLOY WAFER CHECK VALVES

A. Available Manufacturers:

B. Manufacturers:

1. Dual-Plate, Ferrous-Alloy, Wafer-Lug Check Valves:

- a. Gulf Valve Co.
- b. Valve and Primer Corp.
- c. NIBCO INC.
- d. Or Approved Equal.

2. Dual-Plate, Ferrous-Alloy, Double-Flanged-Type Check Valves:

- a. Gulf Valve Co.
- b. Techno Corp.
- c. NIBCO INC.
- d. Or Approved Equal.

C. Ferrous-Alloy Wafer Check Valves, General: API 594, spring loaded.

D. Dual-Plate, Class 125 or 150, Ferrous-Alloy, Double-Flanged Check Valves: Flanged-end body.

## 2.7 SPRING-LOADED, LIFT-DISC CHECK VALVES

A. Available Manufacturers:

B. Manufacturers:

1. Type I, Wafer Lift-Disc Check Valves:

- a. Mueller Steam Specialty. NIBCO INC.
- b. Or Approved Equal.

2. Type II, Compact-Wafer, Lift-Disc Check Valves:

- a. Durabla Fluid Technology, Inc.
- b. Flomatic Valves.
- c. Grinnell Corporation.
- d. Metraflex Co.
- e. Milwaukee Valve Company.
- f. Mueller Steam Specialty.
- g. NIBCO INC.
- h. Or Approved Equal.

3. Type III, Globe Lift-Disc Check Valves:

- a. Durabla Fluid Technology, Inc.
- b. GA Industries, Inc.
- c. Grinnell Corporation.
- d. Metraflex Co.
- e. Milwaukee Valve Company.
- f. NIBCO INC.
- g. Or Approved Equal.

4. Type IV, Threaded Lift-Disc Check Valves:

- a. Check-All Valve Mfg. Co.
- b. Durabla Fluid Technology, Inc.
- c. Grinnell Corporation.
- d. Legend Valve & Fitting, Inc.
- e. Metraflex Co.
- f. Milwaukee Valve Company.
- g. Mueller Steam Specialty.
- h. NIBCO INC.
- i. Watts Industries, Inc.; Water Products Div.
- j. Or Approved Equal.

- C. Lift-Disc Check Valves, General: FCI 74-1, with spring-loaded bronze or alloy disc and bronze or alloy seat.
- D. Type I, Class 125, Wafer Lift-Disc Check Valves: Wafer style with cast-iron shell with diameter matching companion flanges.
- E. Type II, Class 125, Compact-Wafer, Lift-Disc Check Valves: Compact-wafer style with cast-iron shell with diameter made to fit within bolt circle.
- F. Type III, Class 125, Globe Lift-Disc Check Valves: Globe style with cast-iron shell and flanged ends.
- G. Type IV, Class 125, Threaded Lift-Disc Check Valves: Threaded style with bronze shell and threaded ends.

## 2.8 BRONZE GLOBE VALVES

A. Available Manufacturers:

B. Manufacturers:

1. Type 1, Bronze Globe Valves with Metal Disc:

- a. Cincinnati Valve Co.
- b. Grinnell Corporation.
- c. Hammond Valve.
- d. Kitz Corporation of America.
- e. Legend Valve & Fitting, Inc.
- f. Milwaukee Valve Company.
- g. NIBCO INC.
- h. Powell, Wm. Co.
- i. Red-White Valve Corp.
- j. Walworth Co.
- k. Or Approved Equal.

2. Type 2, Bronze Globe Valves with Nonmetallic Disc:

- a. Cincinnati Valve Co.
- b. Grinnell Corporation.
- c. Hammond Valve.
- d. Kitz Corporation of America.
- e. McWane, Inc.; Kennedy Valve Div.
- f. Milwaukee Valve Company.
- g. NIBCO INC.
- h. Powell, Wm. Co.
- i. Red-White Valve Corp.
- j. Walworth Co.
- k. Or Approved Equal.

3. Type 3, Bronze Globe Valves with Renewable Seat and Metal Disc:

- a. Cincinnati Valve Co.
- b. Grinnell Corporation.
- c. Hammond Valve.
- d. Milwaukee Valve Company.
- e. NIBCO INC.
- f. Walworth Co.
- g. Or Approved Equal.

C. Bronze Globe Valves, General: MSS SP-80, with ferrous-alloy hand wheel.

D. Type 1, Class 150, Bronze Globe Valves: Bronze body with bronze disc and union-ring bonnet.

E. Type 3, Class 150, Bronze Globe Valves: Bronze body with bronze disc and renewable seat. Include union-ring bonnet.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- D. Examine threads on valve and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- F. Do not attempt to repair defective valves; replace with new valves.

### 3.2 VALVE APPLICATIONS

- A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:
  - 1. Shutoff Service: Ball valves.
  - 2. Throttling Service: Ball or globe valves.
  - 3. Pump Discharge: Spring-loaded, lift-disc check valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Heating Water Piping: Use the following types of valves:
  - 1. Ball Valves, NPS 2 (DN 50) and Smaller: One or Two-piece, CWP rating, copper alloy.
  - 2. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
  - 3. Lift Check Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, horizontal / vertical, bronze.
  - 4. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 150, bronze.
  - 5. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
  - 6. Wafer Check Valves, NPS 2-1/2 (DN 65) and Larger: Single / Dual-plate, wafer-lug/ double-flanged, Class 150, ferrous alloy.
  - 7. Spring-Loaded, Lift-Disc Check Valves, NPS 2 (DN 50) and Smaller: Type IV, Class 150.
  - 8. Spring-Loaded, Lift-Disc Check Valves, NPS 2-1/2 (DN 65) and Larger: Class 125, cast iron.
  - 9. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.

### 3.3 VALVE INSTALLATION

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.
- F. Install check valves for proper direction of flow and as follows:
  - 1. Swing Check Valves: In horizontal position with hinge pin level.
  - 2. Dual-Plate Check Valves: In horizontal or vertical position, between flanges.
  - 3. Lift Check Valves: With stem upright and plumb.

### 3.4 JOINT CONSTRUCTION

- A. Refer to Division 22 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

### 3.5 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 220523



## SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Metal pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Fiberglass pipe hangers.
  - 4. Metal framing systems.
  - 5. Fiberglass strut systems.
  - 6. Thermal-hanger shield inserts.
  - 7. Fastener systems.
  - 8. Pipe stands.
  - 9. Equipment supports.

#### 1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
  - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
  - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
  - 3. Design seismic-restraint hangers and supports for piping and equipment.

## 1.5 SUBMITTALS

- A. Product Data: For the following:
  - 1. Steel pipe hangers and supports.
  - 2. Fiberglass pipe hangers.
  - 3. Thermal-hanger shield inserts.
  - 4. Powder-actuated fastener systems.
  - 5. Pipe positioning systems.
  
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
  - 1. Trapeze pipe hangers. Include Product Data for components.
  - 2. Metal framing systems. Include Product Data for components.
  - 3. Fiberglass strut systems. Include Product Data for components.
  - 4. Pipe stands. Include Product Data for components.
  - 5. Equipment supports.
  - 6. Welding certificates.

## 1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
  
- B. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1, "Structural Welding Code--Steel."
  - 2. AWS D1.2, "Structural Welding Code--Aluminum."
  - 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
  - 4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
  - 5. ASME Boiler and Pressure Vessel Code: Section IX.

## PART 2 - PRODUCTS

### 2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  - 2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
  - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
  - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
  - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
  
- B. Copper Pipe Hangers:
  - 1. Manufacturers' catalogs indicate that copper pipe hangers are small, typically NPS 4 (DN 100) or smaller, and types available are limited.
  - 2. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
  - 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

## 2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

## 2.3 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig (688-kPa) ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or [ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

## 2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, [zinc-coated] [stainless-] steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

## 2.5 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.
- D. High-Type, Single-Pipe Stand:
  - 1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
  - 2. Base: Stainless steel.
  - 3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
  - 4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

5. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

## 2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

## 2.7 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
  1. Properties: Non-staining, noncorrosive, and nongaseous.
  2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

## PART 3 - EXECUTION

### 3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
- C. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
- D. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- E. Metal framing system in first paragraph below requires calculating and detailing at each use.
- F. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- G. Fiberglass strut system in first paragraph below requires calculating and detailing at each use.
- H. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping
- I. Fastener System Installation:
  1. Verify suitability of fasteners in two subparagraphs below for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick.
  2. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use

- operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
3. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- J. Pipe stand in first paragraph below requires calculating and detailing at each use.
- K. Pipe Stand Installation:
1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
  2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb.
  3. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- L. Equipment support in first paragraph below requires calculating and detailing at each use.
- M. Equipment Support Installation:
1. Fabricate from welded-structural-steel shapes.
  2. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
  3. Install lateral bracing with pipe hangers and supports to prevent swaying.
  4. Install building attachments within concrete slabs or attach to structural steel.
  5. Install additional attachments at concentrated loads, including valves, flanges, and strainers, [NPS 2-1/2 (DN 65)] <Insert size> and larger and at changes in direction of piping.
  6. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts
- N. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- O. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- P. Insulated Piping:
1. Attach clamps and spacers to piping.
  2. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
  3. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
  4. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
  5. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated.
  6. Fill interior voids with insulation that matches adjoining insulation.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
  7. High-compressive-strength inserts may permit use of shorter shields or shields with less arc span. Revise first subparagraph below to suit Project.
  8. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
    - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

Q. Shield Dimensions for Pipe: Not less than the following:

1. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
2. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
3. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
4. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
5. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

R. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

S. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### 3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

### 3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

### 3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
- B. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- C. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099123 "Interior Painting".
- D. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

### 3.5 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
  2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
  3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
  4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
  5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
  6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non-insulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).
  7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
  8. Adjustable Band Hangers (MSS Type 9): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
  9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
  10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
  11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
  12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
  13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
  14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
  15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.

16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
  17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
  18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction might occur.
  19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
  20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
  21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
  2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
  2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
  3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
  4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
  5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
  3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
  6. C-Clamps (MSS Type 23): For structural shapes.
  7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
  8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
  10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
  11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
  12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    - a. Light (MSS Type 31): 750 lb (340 kg).
    - b. Medium (MSS Type 32): 1500 lb (680 kg).
    - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
  13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
  14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
  15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
  2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
  3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
  4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
  5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
  6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
  7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
  8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
    - a. Horizontal (MSS Type 54): Mounted horizontally.
    - b. Vertical (MSS Type 55): Mounted vertically.
    - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

- P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 220529

## SECTION 220548 - VIBRATION AND SEISMIC CONTROLS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Restrained spring isolators.
  - 2. Housed spring mounts.
  - 3. Spring hangers.
  - 4. Spring hangers with vertical-limit stops.
  - 5. Thrust limits.
  - 6. Pipe riser resilient supports.
  - 7. Restraining cables.
- B. Definitions:
  - 1.  $A_v$ : Effective peak velocity related acceleration coefficient.

#### 1.2 SUBMITTALS

- A. Product Data: Include load deflection curves for each vibration isolation device indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Include the following:
  - 1. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
  - 2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
  - 3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
  - 4. Seismic-Restraint Details: Detail fabrication and attachment of seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.
  - 5. Details for Interlocking Snubbers: Include load deflection curves up to 1/2-inch deflection in x, y, and z planes.

#### 1.3 QUALITY ASSURANCE

- A. Seismic-restraint devices shall have horizontal and vertical load testing and analysis performed according to agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-

restraint designs must be signed and sealed by a registered professional engineer. Testing and calculations must include both shear and tensile loads and 1 test or analysis at 45 degrees to the weakest mode.

- B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel."

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### 2.2 VIBRATION ISOLATORS

- A. Available Manufacturers:

1. Ace Mounting Co., Inc.
2. Amber/Booth Company, Inc.
3. B-Line Systems, Inc.
4. California Dynamics Corp.
5. Isolation Technology, Inc.
6. Kinetics Noise Control, Inc.
7. Mason Industries, Inc.
8. Vibration Eliminator Co., Inc.
9. Vibration Isolation Co., Inc.
10. Vibration Mountings & Controls/Korfund.
11. Or Approved Equal.

- B. Restrained Elastomeric Mounts: All-directional elastomeric mountings with seismic restraint.

1. Materials: Cast-ductile-iron housing containing two separate and opposing, molded, bridge-bearing neoprene elements that prevent central threaded sleeve and attachment bolt from contacting the casting during normal operation.
2. Neoprene: Shock-absorbing materials compounded as defined by AASHTO.

- C. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.

4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
  5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 100 psig.
  6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.
- D. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.
1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
  2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
  5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
- E. Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.
1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.
  2. Base: Factory drilled for bolting to structure.
  3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch travel before contacting a resilient collar.
- F. Elastomeric Hangers: Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.
- G. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.
1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
  2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
  5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
  6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
- H. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.
1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
  5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
  6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
  7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
- I. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression and with a load stop. Include rod and angle-iron brackets for attaching to equipment.
1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
  2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
  5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
  6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
  7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.
- J. Pipe Riser Resilient Support: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- thick, 60-durometer neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions.
- K. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes separated by a minimum of 1/2-inch- thick, 60-durometer neoprene. Factory set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction. Shear pin shall be removable and re-insertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

## 2.3 SEISMIC-RESTRAINT DEVICES

### A. Available Manufacturers:

1. Amber/Booth Company, Inc.
2. B-Line Systems, Inc.
3. California Dynamics Corp.
4. Kinetics Noise Control, Inc.
5. Loos & Co., Inc.; Cableware Technology Division.
6. Mason Industries, Inc.
7. TOLCO Incorporated.
8. Unistrut Diversified Products Co.; Wayne Manufacturing Division.
9. Vibration Eliminator Co., Inc.
10. Vibration Isolation Co., Inc.
11. Vibration Mountings & Controls/Korfund.

12. Or Approved Equal.

- B. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer of 40, plus or minus 5, with a flat washer face.
- C. Seismic Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.
  - 1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
  - 2. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer of 40, plus or minus 5.
- D. Restraining Cables: Galvanized steel aircraft cables with end connections made of steel assemblies that swivel to final installation angle and utilize two clamping bolts for cable engagement.
- E. Anchor Bolts: Seismic-rated, drill-in, and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488/E 488M.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install thrust limits at centerline of thrust, symmetrical on either side of equipment.
- B. Install seismic snubbers on isolated equipment. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
- C. Install restraining cables at each trapeze and individual pipe hanger. At trapeze anchor locations, shackle piping to trapeze. Install cables so they do not bend across sharp edges of adjacent equipment or building structure.
- D. Install steel angles or channel, sized to prevent buckling, clamped with ductile-iron clamps to hanger rods for trapeze and individual pipe hangers. At trapeze anchor locations, shackle piping to trapeze. Requirements apply equally to hanging equipment. Do not weld angles to rods.
- E. Install resilient bolt isolation washers on equipment anchor bolts.

#### 3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Inspect isolator seismic-restraint clearance.
  - 2. Test isolator deflection.
  - 3. Inspect minimum snubber clearances.
- B. Provide certification report to A/E.

### 3.3 ADJUSTING

- A. Adjust isolators after piping systems have been filled and equipment is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop.
- D. Adjust air spring leveling mechanism.
- E. Adjust active height of spring isolators.
- F. Adjust snubbers according to manufacturer's written recommendations.
- G. Adjust seismic restraints to permit free movement of equipment within normal mode of operation.
- H. Torque anchor bolts according to equipment manufacturer's written recommendations to resist seismic forces.

END OF SECTION 220548

## SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following mechanical identification materials and their installation:
  - 1. Equipment nameplates
  - 2. Equipment markers
  - 3. Equipment signs
  - 4. Access panel and door markers
  - 5. Valve tags
  - 6. Pipe Markers

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

#### 1.3 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

### PART 2 - PRODUCTS

#### 2.1 EQUIPMENT IDENTIFICATION DEVICES

- A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
  - 1. Data:
    - a. Manufacturer, product name, model number, and serial number.
    - b. Capacity, operating and power characteristics, and essential data.
    - c. Labels of tested compliances.
  - 2. Location: Accessible and visible.
  - 3. Fasteners: As required to mount on equipment.
- B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
  - 1. Terminology: Match schedules as closely as possible.
  - 2. Data:

- a. Name and plan number
  - b. Equipment service
  - c. Design capacity
  - d. Other design parameters such as pressure drop, entering and leaving conditions, and speed
3. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.
- C. Equipment Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
- 1. Data: Instructions for operation of equipment and for safety procedures.
  - 2. Engraving: Manufacturer's standard letter style, of sizes and with terms to match equipment identification.
  - 3. Thickness: 1/8 inch, unless otherwise indicated.
  - 4. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.
- D. Access Panel and Door Markers: 1/16-inch thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch center hole for attachment.
- 1. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

## 2.2 PIPING IDENTIFICATION DEVICES

- A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.
- 1. Colors: Comply with ASME A13.1, unless otherwise indicated.
  - 2. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
  - 3. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
  - 4. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
- B. Pre-tensioned Pipe Markers: Pre-coiled semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.
- C. Shaped Pipe Markers: Preformed semi-rigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.
- D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.
- E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils thick with pressure-sensitive, permanent-type, self-adhesive back.

1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.
2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

### 2.3 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme. Provide 5/32-inch hole for fastener.
  1. Material: 0.032 inch-thick brass/aluminum
  2. Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook

## PART 3 - EXECUTION

### 3.1 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other Division 22 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

### 3.2 EQUIPMENT IDENTIFICATION

- A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:
  1. Fuel-burning units, including boilers, furnaces, heaters
  2. Pumps and similar motor-driven units.
  3. Fans.
- B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.
  1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
  2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
  3. Locate markers where accessible and visible.
    - a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
    - b. Meters, gages, thermometers, and similar units.
    - c. Fuel-burning units, including boilers, furnaces, heaters.
    - d. Pumps and similar motor-driven units.

e. Fans.

- C. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.
1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
  2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
- D. Install access panel markers with screws on equipment access panels.

### 3.3 PIPING IDENTIFICATION

- A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pre-tensioned pipe markers. Use size to ensure a tight fit.
  2. Pipes with OD, Including Insulation, Less Than 6 Inches: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 3/4 inch wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.
  3. Pipes with OD, Including Insulation, 6 Inches and Larger: Shaped pipe markers. Use size to match pipe and secure with fasteners.
  4. Pipes with OD, Including Insulation, 6 Inches and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches wide, lapped at least 3 inches at both ends of pipe marker, and covering full circumference of pipe.
- B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior non-concealed locations as follows:
1. Near each valve and control device.
  2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  3. Near penetrations through walls, floors, ceilings, and non-accessible enclosures.
  4. At access doors, manholes, and similar access points that permit view of concealed piping.
  5. Near major equipment items and other points of origination and termination.
  6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
  7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

### 3.4 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:

1. Valve-Tag Size and Shape:

a. Domestic Water: 1-1/2 inches, round/square

b. Gas: 1-1/2 inches, round/square

### 3.5 ADJUSTING AND CLEANING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

B. Clean faces of mechanical identification devices.

END OF SECTION 220553



## SECTION 220719 – PLUMBING PIPING INSULATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes mechanical insulation for duct, equipment, and pipe, including the following:
  - 1. Insulation Materials:
    - a. Cellular glass.
    - b. Mineral fiber.
    - c. Polystyrene.
  - 2. Fire-rated insulation systems.
  - 3. Adhesives.
  - 4. Mastics.
  - 5. Lagging adhesives.
  - 6. Sealants.
  - 7. Field-applied jackets.
  - 8. Tapes.
  - 9. Securements.
  - 10. Corner angles.

#### 1.3 DEFINITIONS

- A. ASJ: All-service jacket.
- B. FSK: Foil, scrim, kraft paper.
- C. FSP: Foil, scrim, polyethylene.
- D. PVDC: Polyvinylidene chloride.
- E. SSL: Self-sealing lap.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, identify thermal conductivity, thickness, and jackets (both factory and field applied, if any).
- B. Shop Drawings: Show details for the following:
  - 1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
  - 2. Attachment and covering of heat tracing inside insulation.
  - 3. Insulation application at pipe expansion joints for each type of insulation.

4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
  5. Removable insulation at piping specialties, equipment connections, and access panels.
  6. Application of field-applied jackets.
  7. Application at linkages of control devices.
  8. Field application for each equipment type.
- C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:
1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2 (DN 50).
  2. Sheet Form Insulation Materials: 12 inches square.
  3. Jacket Materials for Pipe: 12 inches long by NPS 2 (DN 50).
  4. Sheet Jacket Materials: 12 inches square.
  5. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.
- D. Installer Certificates: Signed by Contractor certifying that installers comply with requirements.
- E. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- F. Field quality-control inspection reports.

## 1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

## 1.7 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing and Piping Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation

application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

## 1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  - 3. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.2 INSULATION MATERIALS

- A. Refer to Part 3 schedule articles for requirements about where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
  - 1. Products:

- a. Cell-U-Foam Corporation; Ultra-CUF.
  - b. Pittsburgh Corning Corporation; Foamglass Super K.
  - c. Or Approved Equal.
- 2. Block Insulation: ASTM C 552, Type I.
  - 3. Special-Shaped Insulation: ASTM C 552, Type III.
  - 4. Board Insulation: ASTM C 552, Type IV.
  - 5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
  - 6. Preformed Pipe Insulation with Factory-Applied [ASJ] [ASJ-SSL]: Comply with ASTM C 552, Type II, Class 2.
  - 7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- G. Mineral-Fiber, Preformed Pipe Insulation:
- 1. Products:
    - a. Fibrex Insulations Inc.; Coreplus 1200.
    - b. Johns Manville; Micro-Lok.
    - c. Knauf Insulation; 1000° Pipe Insulation.
    - d. Manson Insulation Inc.; Alley-K.
    - e. Owens Corning; Fiberglas Pipe Insulation.
    - f. Or Approved Equal.
  - 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
- H. Mineral-Fiber, Pipe Insulation Wicking System: Preformed pipe insulation complying with ASTM C 547, Type I, Grade A, with absorbent cloth factory applied to the entire inside surface of preformed pipe insulation and extended through the longitudinal joint to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth.
- 1. Products:
    - a. Knauf Insulation; Permawick Pipe Insulation.
    - b. Owens Corning; VaporWick Pipe Insulation.
    - c. Or Approved Equal.
- I. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied [ASJ] [FSK jacket] complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F (0.042 W/m x K) or less. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
- 1. Products:
    - a. CertainTeed Corp.; CrimpWrap.
    - b. Johns Manville; MicroFlex.
    - c. Knauf Insulation; Pipe and Tank Insulation.
    - d. Manson Insulation Inc.; AK Flex.
    - e. Owens Corning; Fiberglas Pipe and Tank Insulation.
    - f. Or Approved Equal.

## 2.3 FIRE-RATED INSULATION SYSTEMS

- A. Fire-Rated Board: Structural-grade, press-molded, xonolite calcium silicate, fireproofing board suitable for operating temperatures up to 1700 deg F. Comply with ASTM C 656, Type II, Grade 6. UL tested and certified to provide a 2-hour fire rating.
  - 1. Products:
    - a. Johns Manville; Super Firetemp M.
    - b. Or Approved Equal.
- B. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is UL tested and certified to provide a 2-hour fire rating.
  - 1. Products:
    - a. CertainTeed Corp.; FlameChek.
    - b. Johns Manville; Firetemp Wrap.
    - c. Nelson Firestop Products; Nelson FSB Flameshield Blanket.
    - d. Thermal Ceramics; FireMaster Duct Wrap.
    - e. 3M; Fire Barrier Wrap Products.
    - f. Unifrax Corporation; FyreWrap.
    - g. Vesuvius; PYROSCAT FP FASTR Duct Wrap.
    - h. Or Approved Equal.

## 2.4 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 to 800 deg F.
  - 1. Products:
    - a. Childers Products, Division of ITW; CP-97.
    - b. Foster Products Corporation, H. B. Fuller Company; 81-27/81-93.
    - c. Marathon Industries, Inc.; 290.
    - d. Mon-Eco Industries, Inc.; 22-30.
    - e. Vimasco Corporation; 760.
    - f. Or Approved Equal.
- C. Cellular-Glass, Phenolic-Foam, Polyisocyanurate, and Polystyrene Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.
  - 1. Products:
    - a. Childers Products, Division of ITW; CP-96.
    - b. Foster Products Corporation, H. B. Fuller Company; 81-33.
    - c. Or Approved Equal.
- D. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
  - 1. Products:
    - a. Aeroflex USA Inc.; Aeroseal.
    - b. Armacell LCC; 520 Adhesive.
    - c. Foster Products Corporation, H. B. Fuller Company; 85-75.

- d. RBX Corporation; Rubatex Contact Adhesive.
  - e. Or Approved Equal.
- E. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- 1. Products:
    - a. Childers Products, Division of ITW; CP-82.
    - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
    - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
    - d. Marathon Industries, Inc.; 225.
    - e. Mon-Eco Industries, Inc.; 22-25.
    - f. Or Approved Equal.
- F. Polystyrene Adhesive: Solvent- or water-based, synthetic resin adhesive with a service temperature range of minus 20 to plus 140 deg F.
- 1. Products:
    - a. Childers Products, Division of ITW; CP-96.
    - b. Foster Products Corporation, H. B. Fuller Company; 97-13.
    - c. Or Approved Equal.
- G. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
- 1. Products:
    - a. Childers Products, Division of ITW; CP-82.
    - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
    - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
    - d. Marathon Industries, Inc.; 225.
    - e. Mon-Eco Industries, Inc.; 22-25.
    - f. Or Approved Equal.
- H. PVC Jacket Adhesive: Compatible with PVC jacket.
- 1. Products:
    - a. Dow Chemical Company (The); 739, Dow Silicone.
    - b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
    - c. P.I.C. Plastics, Inc.; Welding Adhesive.
    - d. Red Devil, Inc.; Celulon Ultra Clear.
    - e. Speedline Corporation; Speedline Vinyl Adhesive.
    - f. Or Approved Equal.

## 2.5 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
- 1. Products:
    - a. Childers Products, Division of ITW; CP-35.
    - b. Foster Products Corporation, H. B. Fuller Company; 30-90.

- c. ITW TACC, Division of Illinois Tool Works; CB-50.
  - d. Marathon Industries, Inc.; 590.
  - e. Mon-Eco Industries, Inc.; 55-40.
  - f. Vimasco Corporation; 749.
  - g. Or Approved Equal.
2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
  3. Service Temperature Range: Minus 20 to plus 180 deg F.
  4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
  5. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.
1. Products:
    - a. Childers Products, Division of ITW; CP-30.
    - b. Foster Products Corporation, H. B. Fuller Company; 30-35.
    - c. ITW TACC, Division of Illinois Tool Works; CB-25.
    - d. Marathon Industries, Inc.; 501.
    - e. Mon-Eco Industries, Inc.; 55-10.
    - f. Or Approved Equal.
  2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
  3. Service Temperature Range: 0 to 180 deg F
  4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
  5. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.
1. Products:
    - a. Childers Products, Division of ITW; Encacel.
    - b. Foster Products Corporation, H. B. Fuller Company; 60-95/60-96.
    - c. Marathon Industries, Inc.; 570.
    - d. Mon-Eco Industries, Inc.; 55-70.
    - e. Or Approved Equal.
  2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
  3. Service Temperature Range: Minus 50 to plus 220 deg F
  4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
  5. Color: White.
- E. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
1. Products:
    - a. Childers Products, Division of ITW; CP-10.
    - b. Foster Products Corporation, H. B. Fuller Company; 35-00.
    - c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
    - d. Marathon Industries, Inc.; 550.
    - e. Mon-Eco Industries, Inc.; 55-50.
    - f. Vimasco Corporation; WC-1/WC-5.
    - g. Or Approved Equal.
  2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
  3. Service Temperature Range: Minus 20 to plus 200 deg F.
  4. Solids Content: 63 percent by volume and 73 percent by weight.

5. Color: White.

## 2.6 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
  1. Products:
    - a. Childers Products, Division of ITW; CP-52.
    - b. Foster Products Corporation, H. B. Fuller Company; 81-42.
    - c. Marathon Industries, Inc.; 130.
    - d. Mon-Eco Industries, Inc.; 11-30.
    - e. Vimasco Corporation; 136.
    - f. Or Approved Equal.
  2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
  3. Service Temperature Range: Minus 50 to plus 180 deg F.
  4. Color: White.

## 2.7 SEALANTS

- A. Joint Sealants:
  1. Joint Sealants for Cellular-Glass, Phenolic-Foam, and Polyisocyanurate Products:
    - a. Childers Products, Division of ITW; CP-76.
    - b. Foster Products Corporation, H. B. Fuller Company; 30-45.
    - c. Marathon Industries, Inc.; 405.
    - d. Mon-Eco Industries, Inc.; 44-05.
    - e. Pittsburgh Corning Corporation; Pittseal 444.
    - f. Vimasco Corporation; 750.
    - g. Or Approved Equal.
  2. Joint Sealants for Polystyrene Products:
    - a. Childers Products, Division of ITW; CP-70.
    - b. Foster Products Corporation, H. B. Fuller Company; 30-45/30-46.
    - c. Marathon Industries, Inc.; 405.
    - d. Mon-Eco Industries, Inc.; 44-05.
    - e. Vimasco Corporation; 750.
    - f. Or Approved Equal.
  3. Materials shall be compatible with insulation materials, jackets, and substrates.
  4. Permanently flexible, elastomeric sealant.
  5. Service Temperature Range: Minus 100 to plus 300 deg F.
  6. Color: White or gray.
- B. FSK and Metal Jacket Flashing Sealants:
  1. Products:
    - a. Childers Products, Division of ITW; CP-76-8.
    - b. Foster Products Corporation, H. B. Fuller Company; 95-44.
    - c. Marathon Industries, Inc.; 405.

- d. Mon-Eco Industries, Inc.; 44-05.
  - e. Vimasco Corporation; 750.
  - f. Or Approved Equal.
- 2. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 3. Fire- and water-resistant, flexible, elastomeric sealant.
  - 4. Service Temperature Range: Minus 40 to plus 250 deg F.
  - 5. Color: Aluminum.
- C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

- 1. Products:
  - a. Childers Products, Division of ITW; CP-76.
  - b. Or Approved Equal.
- 2. Materials shall be compatible with insulation materials, jackets, and substrates.
- 3. Fire- and water-resistant, flexible, elastomeric sealant.
- 4. Service Temperature Range: Minus 40 to plus 250 deg F.
- 5. Color: White.

## 2.8 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
- 1. Products:
    - a. Johns Manville; Zeston.
    - b. P.I.C. Plastics, Inc.; FG Series.
    - c. Proto PVC Corporation; LoSmoke.
    - d. Speedline Corporation; SmokeSafe.
    - e. Or Approved Equal.
  - 2. Adhesive: As recommended by jacket material manufacturer.
  - 3. Color: White.
  - 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
    - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
  - 5. Factory-fabricated tank heads and tank side panels.
- D. Metal Jacket:
- 1. Products:
    - a. Childers Products, Division of ITW; Metal Jacketing Systems.
    - b. PABCO Metals Corporation; Surefit.
    - c. RPR Products, Inc.; Insul-Mate.

- d. Or Approved Equal.
- E. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

## 2.9 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.
  - 1. Products:
    - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
    - b. Compac Corp.; 104 and 105.
    - c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
    - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
    - e. Or Approved Equal.
  - 2. Width: 3 inches
  - 3. Thickness: 11.5 mils
  - 4. Adhesion: 90 ounces force/inch in width.
  - 5. Elongation: 2 percent.
  - 6. Tensile Strength: 40 lbf/inch in width.
  - 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136 and UL listed.
  - 1. Products:
    - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
    - b. Compac Corp.; 110 and 111.
    - c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
    - d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.
    - e. Or Approved Equal.
  - 2. Width: 3 inches.
  - 3. Thickness: 6.5 mils.
  - 4. Adhesion: 90 ounces force/inch in width.
  - 5. Elongation: 2 percent.
  - 6. Tensile Strength: 40 lbf/inch in width.
  - 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.
  - 1. Products:
    - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
    - b. Compac Corp.; 130.
    - c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
    - d. Venture Tape; 1506 CW NS.
    - e. Or Approved Equal.
  - 2. Width: 2 inches.
  - 3. Thickness: 6 mils.

4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive and UL listed.

1. Products:
  - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
  - b. Compac Corp.; 120.
  - c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
  - d. Venture Tape; 3520 CW.
  - e. Or Approved Equal.
2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

## 2.10 SECUREMENTS

A. Bands:

1. Products:
  - a. Childers Products; Bands.
  - b. PABCO Metals Corporation; Bands.
  - c. RPR Products, Inc.; Bands.
  - d. Or Approved Equal.
2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015 inch thick, 3/4 inch wide with wing or closed seal.
3. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch diameter shank, length to suit depth of insulation indicated.
  - a. Products:
    - 1) AGM Industries, Inc.; CWP-1.
    - 2) GEMCO; CD.
    - 3) Midwest Fasteners, Inc.; CD.
    - 4) Nelson Stud Welding; TPA, TPC, and TPS.
    - 5) Or Approved Equal.
2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

- a. Products:
  - 1) AGM Industries, Inc.; CWP-1.
  - 2) GEMCO; Cupped Head Weld Pin.
  - 3) Midwest Fasteners, Inc.; Cupped Head.
  - 4) Nelson Stud Welding; CHP.
  - 5) Or Approved equal
  
- 3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
  - a. Products:
    - 1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
    - 2) GEMCO; Perforated Base.
    - 3) Midwest Fasteners, Inc.; Spindle.
    - 4) Or Approved Equal
  
  - b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - c. Spindle: Aluminum, fully annealed, 0.106-inch diameter shank, length to suit depth of insulation indicated.
  - d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
  
- 4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick, aluminum sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
  - a. Products:
    - 1) AGM Industries, Inc.; RC-150.
    - 2) GEMCO; R-150.
    - 3) Midwest Fasteners, Inc.; WA-150.
    - 4) Nelson Stud Welding; Speed Clips.
    - 5) Or Approved Equal.
  
  - b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
  
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch wide, stainless steel or Monel.
  
- D. Wire: 0.062-inch soft-annealed, galvanized steel.
  - 1. Manufacturers:
    - a. ACS Industries, Inc.
    - b. C & F Wire.
    - c. Childers Products.
    - d. PABCO Metals Corporation.
    - e. RPR Products, Inc.
    - f. Or Approved Equal.

## 2.11 CORNER ANGLES

- A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.
- B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005; Temper H-14.
- C. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or 316.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
  - 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
  - 2. Verify that surfaces to be insulated are clean and dry.
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
  - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
  - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.3 COMMON INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches or 4 inches o.c.
    - a. For below ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
  - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above ambient services, do not install insulation to the following:
  - 1. Vibration-control devices.
  - 2. Testing agency labels and stamps.
  - 3. Nameplates and data plates.
  - 4. Manholes.
  - 5. Handholes.
  - 6. Cleanouts.

### 3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
  - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Below-Grade Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire

damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Through-Penetration Firestop Systems."

F. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies according to Division 7 Section "Through-Penetration Firestop Systems."

### 3.5 DUCT AND PLENUM INSULATION INSTALLATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
  - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
  - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.

### 3.6 EQUIPMENT INSULATION INSTALLATION

A. Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.
2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:
  - a. Do not weld anchor pins to ASME-labeled pressure vessels.
  - b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.

- c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
  - d. Do not over compress insulation during installation.
  - e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
  - f. Impale insulation over anchor pins and attach speed washers.
  - g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
  6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
  7. Stagger joints between insulation layers at least 3 inches.
  8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
  9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
  10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

### 3.7 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this Article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
  1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
  2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
  6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
  7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
  9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
  2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
  3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
  4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
  5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### 3.8 CELLULAR-GLASS INSULATION INSTALLATION

#### A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient services, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

### 3.9 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

### 3.10 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

### 3.11 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous UL-listed fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 7 Section "Through-Penetration Firestop Systems."

### 3.12 FINISHES

- A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below.
  - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
    - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

### 3.13 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  - 1. Fire-suppression piping.
  - 2. Drainage piping located in crawl spaces.
  - 3. Below-grade piping.
  - 4. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.14 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water:
  - 1. NPS 3 (DN 75) and Smaller: Insulation shall be any of the following:
    - a. Cellular Glass: 1-1/2 inch thick.
    - b. Mineral-Fiber Pipe Insulation, Type I: 1-1/2 inch thick.
  - 2. NPS 4 (DN 32) and Larger: Insulation shall be any of the following:
    - a. Cellular Glass: 2 inches thick.
    - b. Mineral-Fiber Pipe Insulation, Type I: 2 inches thick.
- B. Domestic Hot and Recirculated Hot Water:
  - 1. NPS 3 (DN 75) and Smaller: Insulation shall be[ any of] the following:
    - a. Cellular Glass: 1-1/2 inches thick.
    - b. Mineral-Fiber Pipe Insulation, Type I: 1-1/2 inch thick.

2. NPS 4 (DN 100) and Larger: Insulation shall be any of the following:

- a. Cellular Glass: 2 inches thick.
- b. Mineral-Fiber Pipe Insulation, Type I: 2 inch thick.

C. Roof Leader and Storm:

1. NPS 4 (DN 32) and Smaller: Insulation shall be any of the following:

- a. Cellular Glass: 1 inch thick.
- b. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.

D. Condensate Drain:

1. Refer to Dwg. P0.01 for insulation requirements.

### 3.15 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Exposed:

1. Aluminum, Smooth: 0.016 inch thick.

END OF SECTION 220719

## SECTION 221116 - DOMESTIC WATER PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes domestic water piping inside the building and 5 feet to outside of the building.
- B. Related Sections include the following:
  - 1. Division 22 Section "Domestic Water Piping Specialties" for water distribution piping specialties.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing domestic water piping systems with 80 psig, unless otherwise indicated.

#### 1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Water Samples: Specified in Part 3 "Cleaning" Article.
- C. Field quality-control test reports.

#### 1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.2 PIPING MATERIALS

- A. Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

### 2.3 COPPER TUBE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Types K and L (ASTM B 88M, Types A and B), water tube, annealed temper.
  - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
  - 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
  - 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- B. Hard Copper Tube: ASTM B 88, Types L and M (ASTM B 88M, Types B and C), water tube, drawn temper.
  - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
  - 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
  - 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

### 2.4 VALVES

- A. General-duty ball valves are specified in Division 22 Section "Plumbing Valves."

- B. Backflow preventers, strainers, and drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

## PART 3 - EXECUTION

### 3.1 PIPE AND FITTING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Fitting Option: brazed joints may be used on aboveground copper tubing.
- D. Under-Building-Slab, Domestic Water Piping on House Side of Water Meter, NPS 4 (DN 100) and Smaller: Soft copper tube, Type K with no fittings.
- E. Aboveground Domestic Water Piping: Use the following piping materials for each size range:
  - 1. NPS 1 (DN 25) and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
  - 2. NPS 2 (DN 50) and larger: Hard copper tube, Type L; copper pressure fittings; and soldered joints.

### 3.2 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Shutoff Duty: Use ball valves for piping NPS 3 (DN 75) and smaller.
  - 2. Drain Duty: Hose-end drain valves.
- B. Install drain valves at low points in horizontal piping, and where required to drain water piping.
  - 1. Install hose-end drain valves at low points in water mains, risers, and branches.

### 3.3 PIPING INSTALLATION

- A. Install under-building-slab copper tubing according to CDA's "Copper Tube Handbook."
- B. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Basic Mechanical Materials and Methods."
- C. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Division 22 Section "Basic Mechanical Materials and Methods."

- D. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

### 3.4 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 22 Section "Basic Mechanical Materials and Methods."
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

### 3.5 HANGER AND SUPPORT INSTALLATION

- A. Seismic-restraint devices are specified in Division 22 Section "Vibration and Seismic Controls."
- B. Pipe hanger and support devices are specified in Division 22 Section "Hangers and Supports for Plumbing and Piping Equipment". Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet: MSS Type 49, spring cushion rolls, if indicated.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Install supports according to Division 22 Section "Hangers and Supports for Plumbing and Piping Equipment".
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.
- F. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 3/4 (DN 20) and Smaller: 60 inches with 3/8-inch rod.
  - 2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches with 3/8-inch rod.
  - 3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches with 3/8-inch rod.
  - 4. NPS 2-1/2 (DN 65): 108 inches with 1/2-inch rod.
  - 5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet with 1/2-inch rod.
  - 6. NPS 6 (DN 150): 10 feet with 5/8-inch rod.
- G. Install supports for vertical copper tubing every 10 feet.

### 3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

### 3.7 FIELD QUALITY CONTROL

- A. Inspect domestic water piping as follows:
  - 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
  - 2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
    - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
  - 3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
  - 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- B. Test domestic water piping as follows:
  - 1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
  - 2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  - 3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - 4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
  - 5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
  - 6. Prepare reports for tests and required corrective action.

### 3.8 ADJUSTING

- A. Perform the following adjustments before operation:
  - 1. Close drain valves, hydrants, and hose bibbs.
  - 2. Open shutoff valves to fully open position.
  - 3. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
  - 4. Remove and clean strainer screens. Close drain valves and replace drain plugs.
  - 5. Check plumbing specialties and verify proper settings, adjustments, and operation.

### 3.9 CLEANING

- A. Clean and disinfect potable and non-potable domestic water piping as follows:
  - 1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
  - 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Fill and isolate system according to either of the following:
      - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
    - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- B. Prepare and submit reports of purging and disinfecting activities.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION 221116

## SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following domestic water piping specialties:
  - 1. Reduced-Pressure-Principle Backflow Preventers.
  - 2. Balancing valves.
  - 3. Strainers.
  - 4. Hose Bibbs.
  - 5. Wall hydrants.
  - 6. Drain valves.
  - 7. Water hammer arresters.
  - 8. Trap-seal primer valves.
- B. All plumbing fixtures, backflow preventers, valves, strainers and fittings for potable water system shall be lead-free type in compliant with requirements of NSF/ANSI Standard 61.
- C. PERFORMANCE REQUIREMENTS
- D. Minimum Working Pressure for Domestic Water Piping Specialties: 80 psig, unless otherwise indicated.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

#### 1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. NSF Compliance:

1. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 REDUCED-PRESSURE-PRINCIPLE BACKFLOW PREVENTERS (Lead Free Type)

A. Backflow Preventers:

1. 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:
  - a. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
  - b. Ames Fire & Waterworks.
  - c. Conbraco Industries, Inc.
  - d. Zurn Industries.
  - e. Or Approved Equal.
2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Size: Refer to drawings.
5. Accessories:
  - a. Valves NPS 2 (DN 50) and Smaller: Ball type with threaded ends on inlet and outlet.
  - b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.2 BALANCING VALVES (Lead Free Type)

A. Memory-Stop Balancing Valves:

1. 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:
  - a. Conbraco Industries, Inc.
  - b. Crane Co.; Crane Valve Group; Crane Valves.
  - c. Milwaukee Valve Company.
  - d. NIBCO INC.
  - e. Red-White Valve Corp.
  - f. Or Approved Equal.
2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig minimum CWP.
4. Size: NPS 2 (DN 50) or smaller.
5. Body: Copper alloy.
6. Port: Standard or full port.

7. Ball: Chrome-plated brass.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

## 2.3 STRAINERS FOR DOMESTIC WATER PIPING (Lead Free Type)

### A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron[ with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and] for NPS 2-1/2 (DN 65) and larger.
3. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:
  - a. Strainers NPS 2 (DN 50) and Smaller: 0.020 inch.
  - b. Strainers NPS 2-1/2 to NPS 4 (DN 65 to DN 100): 0.045 inch.
6. Drain: Pipe plug or Factory-installed, hose-end drain valve.

## 2.4 DRAIN VALVES (Lead Free Type)

### A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4 (DN 20).
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

### B. Gate-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 3/4 (DN 20).
4. Body: ASTM B 62 bronze.
5. Inlet: NPS 3/4 (DN 20) threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

### C. Stop-and-Waste Drain Valves:

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig minimum CWP or Class 125.
3. Size: NPS 3/4 (DN 20).

4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 (DN 6) side outlet with cap.

## 2.5 HOSE BIBBS

### A. Hose Bibbs: Refer to plumbing schedule.

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral, non-removable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

## 2.6 WALL HYDRANTS

### A. Non-Freeze Wall Hydrants: Refer to plumbing schedule.

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Josam Company.
  - b. MIFAB, Inc.
  - c. Prier Products, Inc.
  - d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - e. Tyler Pipe; Wade Div.
  - f. Watts Drainage Products Inc.
  - g. Woodford Manufacturing Company.
  - h. Zurn Plumbing Products Group; Light Commercial Operation.
  - i. Zurn Plumbing Products Group; Specification Drainage Operation.
  - j. Or Approved Equal.
3. Standard: ASME A112.21.3M for exposed-outlet, self-draining wall hydrants.
4. Pressure Rating: 125 psig.
5. Operation: Loose key.
6. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
7. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).

8. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
9. Box: Deep, flush mounting with cover.
10. Box and Cover Finish: Chrome plated.
11. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
12. Nozzle and Wall-Plate Finish: Rough bronze.
13. Operating Keys(s): Two (2) with each wall hydrant.

## 2.7 WATER HAMMER ARRESTERS

### A. Water Hammer Arresters:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. AMTROL, Inc.
  - b. Josam Company.
  - c. MIFAB, Inc.
  - d. PPP Inc.
  - e. Sioux Chief Manufacturing Company, Inc.
  - f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - g. Tyler Pipe; Wade Div.
  - h. Watts Drainage Products Inc.
  - i. Zurn Plumbing Products Group; Specification Drainage Operation.
  - j. Or Approved Equal.
3. Standard: ASSE 1010 or PDI-WH 201.
4. Type: [Metal bellows] [Copper tube with piston].
5. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

## 2.8 TRAP-SEAL PRIMER VALVES

### A. Supply-Type, Trap-Seal Primer Valves:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. MIFAB, Inc.
  - b. PPP Inc.
  - c. Sioux Chief Manufacturing Company, Inc.
  - d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - e. Watts Industries, Inc.; Water Products Div.
  - f. Or Approved Equal.

3. Standard: ASSE 1018.
4. Pressure Rating: 125 psig minimum.
5. Body: Bronze.
6. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
7. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
8. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Refer to Division 22 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install water control valves with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
- C. Install balancing valves in locations where they can easily be adjusted.
- D. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet. Refer to plumbing schedule for locations, make & model.
- E. Install water hammer arresters in water piping according to PDI-WH 201.
- F. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- G. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.
- H. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

### 3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.
- B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### 3.3 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
  - 1. Outlet boxes.
  - 2. Supply-type, trap-seal primer valves.
  
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping And Equipment."

### 3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and prepare test reports:
  - 1. Test each system according to authorities having jurisdiction and the device's reference standard.
  
- B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

### 3.5 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 221119



## SECTION 221316 - SANITARY WASTE AND VENT PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following for soil, waste, and vent piping inside the building:
  - 1. Pipe, tube, and fittings.
  - 2. Special pipe fittings.
  - 3. Encasement for underground metal piping.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures" and International Building Code – New York Edition – Latest Edition

#### 1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Shop Drawings:
  - 1. Design Calculations: Signed and sealed by a qualified professional engineer for selecting seismic restraints.
  - 2. Sovent Drainage System: Include plans, elevations, sections, and details.
- C. Field quality-control inspection and test reports.

#### 1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

### 2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service and Extra-Heavy class(es).
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, hemp fiber.

### 2.4 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. Solvent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.
- C. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
  - 1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.
    - a. Manufacturers:
      - 1) ANACO.
      - 2) Fernco, Inc.
      - 3) Ideal Div.; Stant Corp.
      - 4) Mission Rubber Co.
      - 5) Tyler Pipe; Soil Pipe Div.
      - 6) Charlotte Pipe & Foundry Co.
      - 7) Or Approved Equal.

2. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.
  - a. Manufacturers:
    - 1) ANACO.
    - 2) Clamp-All Corp.
    - 3) Ideal Div.; Stant Corp.
    - 4) Mission Rubber Co.
    - 5) Tyler Pipe; Soil Pipe Div.
    - 6) Charlotte Pipe & Foundry Co.
    - 7) Or Approved Equal.
  
3. Heavy-Duty, Shielded, Cast-Iron Couplings: ASTM A 48/A 48M, two-piece, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve.
  - a. Manufacturers:
    - 1) MG Piping Products Co.
    - 2) Or Approved Equal.

## 2.5 DUCTILE-IRON PIPE AND FITTINGS

- A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end, unless grooved or flanged ends are indicated.
  1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
  
- B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end, unless grooved or flanged ends are indicated.
  1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  2. Gaskets: AWWA C111, rubber.
  
- C. Flanges: ASME 16.1, Class 125, cast iron.

## 2.6 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
  1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
  
- B. Hard Copper Tube: ASTM B 88, Types L (ASTM B 88M, Types B and C), water tube, drawn temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
3. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

C. Soft Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B), water tube, annealed temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

## 2.7 SPECIAL PIPE FITTINGS

A. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Manufacturers:
  - a. Cascade Waterworks Mfg. Co.
  - b. Mission Rubber Co.
  - c. Or Approved Equal

B. Pressure Pipe Couplings: AWWA C219 metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.

1. Manufacturers:
  - a. Cascade Waterworks Mfg. Co.
  - b. Dresser, Inc.; DMD Div.
  - c. EBAA Iron Sales, Inc.
  - d. Ford Meter Box Company, Inc. (The); Pipe Products Div.
  - e. JCM Industries, Inc.
  - f. Romac Industries, Inc.
  - g. Smith-Blair, Inc.
  - h. Viking Johnson.
  - i. Or Approved Equal.

2. Center-Sleeve Material: Manufacturer's standard.
3. Gasket Material: Natural or synthetic rubber.
4. Metal Component Finish: Corrosion-resistant coating or material.

C. Flexible Ball Joints: Ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include gasketed ball-joint section and ductile-iron gland, rubber gasket, and steel bolts.

1. Manufacturers:
  - a. EBAA Iron Sales, Inc.
  - b. Or Approved Equal.

D. Expansion Joints: Two or three-piece, ductile-iron assembly consisting of telescoping sleeve(s) with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

1. Manufacturers:

- a. EBAA Iron Sales, Inc.
- b. Romac Industries, Inc.
- c. Star Pipe Products; Star Fittings Div.
- d. Or Approved Equal.

E. Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

1. Manufacturers:

- a. SIGMA Corp.
- b. Or Approved Equal.

## 2.8 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Description: ASTM A 674 or AWWA C105, high-density, crosslaminated PE film of 0.004-inch minimum thickness.

B. Form: Sheet or tube.

C. Color: Black.

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground, soil and waste piping shall be any of the following:

1. Hubless cast-iron soil pipe and fittings and couplings; and hubless-coupling joints.
2. Steel pipe, drainage fittings, and threaded joints.
3. Stainless-steel pipe and fittings, gaskets, and gasketed joints.
4. Copper DWV tube, copper drainage fittings, and soldered joints.
5. Dissimilar Pipe-Material Couplings: Shielded Non-pressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

C. Aboveground, soil and waste piping NPS 5 (DN 125) and larger shall be any of the following:

1. Hubless cast-iron soil pipe and fittings shielded, stainless-steel couplings; and hubless-coupling joints.

2. Steel pipe, drainage fittings, and threaded joints.
  3. Dissimilar Pipe-Material Couplings: Shielded Non-pressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- D. Aboveground, vent piping NPS 4 (DN 100) and smaller shall be any of the following:
1. Hubless cast-iron soil pipe and fittings; couplings; and hubless-coupling joints.
  2. Steel pipe, drainage fittings, and threaded joints.
  3. Stainless-steel pipe and fittings gaskets, and gasketed joints.
  4. Copper DWV tube, copper drainage fittings, and soldered joints.
    - a. Option for Vent Piping, NPS 2-1/2 and NPS 3-1/2 (DN 65 and DN 90): Hard copper tube, Type M (Type C); copper pressure fittings; and soldered joints.
  5. Dissimilar Pipe-Material Couplings: Shielded nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- E. Aboveground, vent piping NPS 5 (DN 125) and larger shall be any of the following:
1. Hubless cast-iron soil pipe and fittings; shielded, stainless-steel couplings; and hubless-coupling joints.
  2. Steel pipe, drainage fittings, and threaded joints.
  3. Dissimilar Pipe-Material Couplings: Shielded Non-pressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- F. Underground, soil, waste, and vent piping NPS 4 (DN 100) and smaller shall be any of the following:
1. Service class, cast-iron bell and spigot type soil pipe with gasketed joints.
  2. Stainless-steel pipe and fittings, gaskets, and gasketed joints.
  3. Dissimilar Pipe-Material Couplings: Shielded Non-pressure pipe couplings for joining dissimilar pipe materials with small difference in OD.
- G. Underground, soil and waste piping NPS 5 (DN 125) and larger shall be any of the following:
1. Service class, cast-iron bell and spigot type soil pipe with gasketed joints.
  2. Dissimilar Pipe-Material Couplings: Shielded nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

### 3.2 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Division 22 Section "Basic Mechanical Materials and Methods."
- B. Install seismic restraints on piping. Seismic-restraint devices are specified in Division 22 Section "Vibration and Seismic Controls."
- C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- D. Install underground, ductile-iron, special pipe fittings according to AWWA C600.

1. Install encasement on piping according to ASTM A 674 or AWWA C105.
- E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Basic Mechanical Materials and Methods."
- F. Install wall-penetration fitting at each service pipe penetration through foundation wall. Make installation watertight.
- G. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.
- H. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- I. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- J. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
  2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
  3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- K. Install engineered soil and waste drainage and vent piping systems as follows:
1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
  2. Solvent Drainage System: Comply with ASSE 1043 and vent fitting manufacturer's written installation instructions.
  3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- L. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- M. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

### 3.3 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 22 Section "Basic Mechanical Materials and Methods."
- B. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- C. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
- D. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

### 3.4 VALVE INSTALLATION

- A. General valve installation requirements are specified in Division 22 Section "Plumbing Valves."

### 3.5 HANGER AND SUPPORT INSTALLATION

- A. Seismic-restraint devices are specified in Division 22 Section "Vibration and Seismic Controls."
- B. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing and Piping Equipment." Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 2. Install individual, straight, horizontal piping runs according to the following:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Install supports according to Division 22 Section "Hangers and Supports for Plumbing and Piping Equipment."
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches with 3/8-inch rod.
  - 2. NPS 3 (DN 80): 60 inches with 1/2-inch rod.
  - 3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches with 5/8-inch rod.
  - 4. NPS 6 (DN 150): 60 inches with 3/4-inch rod.

- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/4 (DN 32): 84 inches with 3/8-inch rod.
  - 2. NPS 1-1/2 (DN 40): 108 inches with 3/8-inch rod.
  - 3. NPS 2 (DN 50): 10 feet with 3/8-inch rod.
  - 4. NPS 2-1/2 (DN 65): 11 feet with 1/2-inch rod.
  - 5. NPS 3 (DN 80): 12 feet with 1/2-inch rod.
  - 6. NPS 4 and NPS 5 (DN 100 and DN 125): 12 feet with 5/8-inch rod.
  - 7. NPS 6 (DN 150): 12 feet with 3/4-inch rod.
- I. Install supports for vertical steel piping every 15 feet.
- J. Install hangers for stainless-steel piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 2 (DN 50): 84 inches with 3/8-inch rod.
  - 2. NPS 3 (DN 80): 96 inches with 1/2-inch rod.
  - 3. NPS 4 (DN 100): 108 inches with 1/2-inch rod.
  - 4. NPS 6 (DN 150): 10 feet with 5/8-inch rod.
- K. Install supports for vertical stainless-steel piping every 10 feet.
- L. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/4 (DN 32): 72 inches with 3/8-inch rod.
  - 2. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches with 3/8-inch rod.
  - 3. NPS 2-1/2 (DN 65): 108 inches with 1/2-inch rod.
  - 4. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet with 1/2-inch rod.
  - 5. NPS 6 (DN 150): 10 feet with 5/8-inch rod.
- M. Install supports for vertical copper tubing every 10 feet.
- N. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
  - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
  - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.

3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

### 3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
  4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
  5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  6. Prepare reports for tests and required corrective action.

### 3.8 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.

- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221316



## SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following drainage piping specialties:
  - 1. Cleanouts.
  - 2. Floor drains.
  - 3. Miscellaneous drainage piping specialties.

#### 1.3 SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.
- B. Manufacturer Seismic Qualification Certification: Submit certification that all accessories, and components will withstand seismic forces defined in Division 22 Section "Vibration and Seismic Controls." Include the following:
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

#### 1.4 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

## 1.5 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.
- B. Coordinate size and location of roof penetrations.

## 1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Cultures: Provide 1-gal. bottles of bacteria culture recommended by manufacturer of FOG disposal systems equal to 200 percent of amount installed, but no fewer than 2 1-gal. bottles.

## PART 2 - PRODUCTS

### 2.1 CLEANOUTS

- A. Metal Floor Cleanouts:
  - 1. 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:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated or a comparable product by one of the following:
    - a. MIFAB, Inc.
    - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    - c. Tyler Pipe; Wade Div.
    - d. Watts Drainage Products Inc.
    - e. Or Approved Equal.
- B. Stainless Steel Wall Cleanouts:
  - 1. 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:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated or a comparable product by one of the following:

- a. MIFAB, Inc.
- b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
- c. Tyler Pipe; Wade Div.
- d. Watts Drainage Products Inc.
- e. Or Approved Equal.

## 2.2 FLOOR DRAINS

### A. Cast-Iron Floor Drains:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated or a comparable product by one of the following:
  - a. MIFAB, Inc.
  - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - c. Tyler Pipe; Wade Div.
  - d. Watts Drainage Products Inc.
  - e. Or Approved Equal.
4. Standard: ASME A112.6.3 with backwater valve.
5. Pattern: Floor drain.
6. Outlet: Side.
7. Sediment Bucket: Refer to plumbing schedule.
8. Top or Strainer Material: Bronze.
9. Top of Body and Strainer Finish: Nickel bronze.
10. Top Shape: Round.

## 2.3 MISCELLANEOUS DRAINAGE PIPING SPECIALTIES

### A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping [with increaser fitting of size indicated].

### B. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.
  - a. NPS 2 (DN 50): 4-inch minimum water seal.
  - b. NPS 2-1/2 (DN 65) and Larger: 5-inch minimum water seal.

### C. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 (DN 15) side inlet.

D. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend [1 inch (25 mm)] [2 inches (51 mm)] <Insert dimension> above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

F. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

G. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

H. Frost-Resistant Vent Terminals:

1. Description: Manufactured or shop-fabricated assembly constructed of copper, lead-coated copper, or galvanized steel.
2. Design: To provide 1-inch (25-mm) enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

I. Expansion Joints:

1. Standard: ASME A112.21.2M.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

J. Downspout Boots:

1. Description: Manufactured, ASTM A 48/A 48M, gray-iron casting, with strap or ears for attaching to building; NPS 4 (DN 100) outlet; and shop-applied bituminous coating.

2. Size: Inlet size to match downspout.
3. Description: ASTM A 74, Service class, hub-and-spigot, cast-iron soil pipe.
4. Size: Same as or larger than connected downspout.

K. Conductor Nozzles:

1. Description: Bronze body with threaded inlet and bronze wall flange with mounting holes.
2. Size: Same as connected conductor.

## 2.4 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft.
2. Vent Pipe Flashing: 8 oz./sq. ft.

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Refer to Division 22 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.

### 3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

### 3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

## SECTION 224213 – PLUMBING FIXTURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY:

- A. This Section includes the following conventional plumbing fixtures and related components:
  - 1. Faucets for lavatories and sinks
  - 2. Toilet seats
  - 3. Fixture supports
  - 4. Water closets
  - 5. Lavatories
  - 6. Sinks

#### 1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- C. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.
- D. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.
- B. Shop Drawings: Diagram power, signal, and control wiring.

- C. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.
- D. Warranty: Special warranty specified in this Section.

## 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
  - 1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Regulatory Requirements: Comply with requirements in ICC A117.1 – 1998 or most current edition, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.
- D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- G. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
  - 1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
  - 2. Plastic Lavatories: ANSI Z124.3.
  - 3. Plastic Laundry Trays: ANSI Z124.6.
  - 4. Plastic Mop-Service Basins: ANSI Z124.6.
  - 5. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
  - 6. Slip-Resistant Bathing Surfaces: ASTM F 462.
  - 7. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
  - 8. Vitreous-China Fixtures: ASME A112.19.2M.
  - 9. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.

- H. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
  2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
  3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
  4. Faucets: ASME A112.18.1.
  5. Hose-Connection Vacuum Breakers: ASSE 1011.
  6. Hose-Coupling Threads: ASME B1.20.7.
  7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
  8. NSF Potable-Water Materials: NSF 61.
  9. Pipe Threads: ASME B1.20.1.
  10. Supply Fittings: ASME A112.18.1.
  11. Brass Waste Fittings: ASME A112.18.2.
- I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
1. Atmospheric Vacuum Breakers: ASSE 1001.
  2. Brass and Copper Supplies: ASME A112.18.1.
  3. Plastic Tubular Fittings: ASTM F 409.
  4. Brass Waste Fittings: ASME A112.18.2.
- J. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Disposers: ASSE 1008 and UL 430.
  2. Flexible Water Connectors: ASME A112.18.6.
  3. Floor Drains: ASME A112.6.3.
  4. Grab Bars: ASTM F 446.
  5. Hose-Coupling Threads: ASME B1.20.7.
  6. Hot-Water Dispensers: ASSE 1023 and UL 499.
  7. Off-Floor Fixture Supports: ASME A112.6.1M.

8. Pipe Threads: ASME B1.20.1.
9. Plastic Toilet Seats: ANSI Z124.5.

## 1.6 WARRANTY

- A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace components of whirlpools that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Structural failures of unit shell.
    - b. Faulty operation of controls, blowers, pumps, heaters, and timers.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
  2. Warranty Period for Commercial Applications: One (1) year from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 LAVATORY FAUCETS: (Refer to plumbing schedule on plans)

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on drawings or a pre-approved product.

### 2.2 TOILET SEATS: (Refer to plumbing schedule on plans)

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on drawings or a pre-approved product.
2. Description: Toilet seat for water-closet-type fixture.
  - a. Material: Molded, Heavy duty, solid plastic with antimicrobial agent.
  - b. Configuration: Open front.
  - c. Size: Elongated.
  - d. Hinge Type: CK, check.
  - e. Class: Standard commercial.
  - f. Color: White.

### 2.3 FIXTURE SUPPORTS: (Refer to plumbing schedule on plans)

- A. Manufacturers: Subject to compliance with requirements, provide the product indicated on drawings or a pre-approved product.
- B. Water-Closet Supports:

1. Description: Combination carrier designed for accessible mounting height of wall-mounting, water-closet-type fixture. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

C. Lavatory Supports:

1. Description: Type II, lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

2.4 WATER CLOSETS: (Refer to plumbing schedule on plans)

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on drawings or a pre-approved product.

2.5 LAVATORIES: (Refer to plumbing schedule on plans)

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on drawings or a pre-approved product.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.
- B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
  1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
  2. Use carrier supports without waste fitting for fixtures with tubular waste piping.

3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.
  - D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
  - E. Install wall-mounting fixtures with tubular waste piping attached to supports.
  - F. Install counter-mounting fixtures in and attached to casework.
  - G. Install fixtures level and plumb according to roughing-in drawings.
  - H. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
    1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Division 22 Section "Valves."
  - I. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
  - J. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
  - K. Install hard wired flushometer valves for accessible water closets with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
  - L. Install toilet seats on water closets.
  - M. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
  - N. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
  - O. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
  - P. Install traps on fixture outlets.
    1. Exception: Omit trap on fixtures with integral traps.
    2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
  - Q. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
  - R. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal

protruding fittings. Escutcheons are specified in Division 22 Section "Basic Plumbing Materials and Methods."

- S. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 7 Section "Joint Sealants."

### 3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding."
- D. Connect wiring according to Division 26 Section "Wiring Devices."

### 3.4 FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.
- E. All flushometer shall be hard wire type.

### 3.5 ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Operate and adjust controls. Replace damaged and malfunctioning units and controls.
- C. Adjust water pressure at faucets and flushometers to produce proper flow and stream.
- D. Replace washers and seals of leaking and dripping faucets and stops.

### 3.6 CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
  - 1. Remove faucets and strainers, remove sediment and debris, and reinstall strainers and faucets.
  - 2. Remove sediment and debris from drains.
- B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

### 3.7 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213

## SECTION 224716 - WATER COOLERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes water coolers with bottle filling stations.

#### 1.3 DEFINITIONS

- A. Accessible water cooler: Fixture that can be approached and used by people with disabilities.
- B. Fitting: Device that controls flow of water into or out of fixture.
- C. Water Cooler: Electrically powered fixture for generating and delivering cooled drinking water.

#### 1.4 SUBMITTALS

- A. Product Data: For each fixture indicated. Include rated capacities, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For fixtures to include in emergency, operation, and maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- C. ARI Standard: Comply with ARI's "Directory of Certified Drinking Water Coolers" for style classifications.

- D. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.
- E. ASHRAE Standard: Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants," for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant, unless otherwise indicated.

## PART 2 - PRODUCTS

### 2.1 WATER COOLERS WITH BOTTLE FILLING STATIONS: (Refer to plumbing schedule)

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on drawings or a comparable product by one of the following:
  - a. Elkay Manufacturing Co.
  - b. Haws Corporation.
  - c. Oasis Corporation.
  - d. Halsey Taylor.
  - e. Or Approved Equal.

### 2.2 PRODUCT SPECIFICATION

1. Unit shall include an electric water cooler with bottle filling station. Unit shall deliver 8 GPH of 50°F of drinking water at 90°F ambient and 80°F inlet water. Lower unit shall have pushbar activation.
2. Bottle filling unit shall include an electronic sensor for touchless activation with an automatic 20-second shut-off timer. LED light shall illuminate the water dispensing area, brightening as water is being dispensed.
3. Unit shall include a Green Ticker™ displaying count of plastic bottles saved from waste.
4. Bottle filler shall provide a 1.1 - 1.5 gpm flow rate with laminar flow to minimize splashing. Unit shall include the WaterSentry® Plus 3000-gallon capacity filter, certified to NSF/ANSI 42 & 53, with visual filter monitor to indicate when replacement is necessary.
5. Unit shall automatically detect a new filter and reset visual filter monitor accordingly.
6. Unit shall have the ability to turn off refrigeration system as needed, in addition to self-diagnosing system issues and display messages related.
7. Unit shall include integrated silver ion anti-microbial protection in key areas.
8. Unit shall meet ADA guidelines.
9. Unit shall be a lead-free design which shall be certified to NSF/ANSI 61 and 372 and meets Federal and State low-lead requirements.
10. Unit shall be certified to UL399 and CAN/CSA 22.2 No. 120 and shall be FCC compliant.

## 2.3 STANDARD FEATURES

- Sanitary, touchless activation with auto 20-second shut-off (Bottle Filler)
- Easy-touch front and side pushbar controls (Cooler)
  - Visual User Interface display includes: Innovative Green Ticker™ counts bottles saved from waste
  - LED Visual Filter Monitor shows when replacement is necessary
- WaterSentry® Plus 3000-gallon capacity Filtration System, certified to NSF/ANSI 42 & 53 (Lead, Class 1 Particulate, Chlorine, Taste & Odor)
- Integrated Silver Ion Anti-microbial Protection in key areas
- Quick Fill Rate: 1.1 gpm
- Laminar Flow provides minimal splash
- Vandal-Resistant bubbler
- Real Drain System eliminates standing water
- Cooler panel finishes: Stainless Steel
- Automatic filter status reset with each filter change

## 2.4 COOLING SYSTEM

- Compressor: hermetically-sealed, reciprocating type, single phase. Sealed-in lifetime lubrication.
- Condenser: Fan cooled, copper tube with aluminum fins. Fan motor shall be permanently lubricated.
- Cooling Unit: Combination tube-tank type. Self-cleansing. Continuous copper tubing with stainless steel tank. Fully insulated with EPS foam which meets UL requirements for self-extinguishing material.
- Refrigerant Control: Refrigerant R134a shall be controlled by accurately calibrated capillary tube.
- Temperature Control: Electronic temperature control requires no adjustment
- Temperature Sensing Device: Fully solid-state temperature sensing has no moving parts.

## 2.5 CONSTRUCTION

- Stainless Steel basin with integral drain.

- Galvanized structural steel cooler chassis provides structural integrity.
- Stainless Steel bottle filler wrapper with ABS plastic alcove.
- Cooler cabinet shall be Stainless Steel construction.
- Vandal-resistant bubbler shall be one-piece, heavy-duty construction.

## 2.6 REPLACEMENT FILTERS

1. 51300C\_12PK (twelve) for each unit.

## 2.7 WARRANTY

1. 5-year limited warranty shall be provided on the unit's refrigeration system. Electrical components and water system shall be warranted for 12 months from date of installation or 18 months from factory shipment, whichever date falls first.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before fixture installation. Verify that sizes and locations of piping and types of supports match those indicated.
- B. Examine walls and floors for suitable conditions where fixtures are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLICATIONS

- A. Use mounting frames for water coolers, unless otherwise indicated.
- B. Use chrome-plated brass or copper tube, fittings, and valves in locations exposed to view. Plain copper tube, fittings, and valves may be used in concealed locations.

### 3.3 INSTALLATION

- A. Install mounting frames affixed to building construction and attach recessed water coolers to mounting frames, unless otherwise indicated.
- B. Install fixtures level and plumb. For fixtures indicated for children, install at height required by authorities having jurisdiction.

- C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Division 22 Section "Plumbing Valves."
- D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.
- E. Install pipe escutcheons at wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings. Escutcheons are specified in Division 22 Section "Basic Plumbing Materials and Methods."
- F. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 7 Section "Joint Sealants."

### 3.4 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low Voltage Electrical Power Conductors and Cables."

### 3.5 FIELD QUALITY CONTROL

- A. Water Cooler Testing: After electrical circuitry has been energized, test for compliance with requirements. Test and adjust controls and safeties.
  - 1. Remove and replace malfunctioning units and retest as specified above.
  - 2. Report test results in writing.

### 3.6 ADJUSTING

- A. Adjust fixture flow regulators for proper flow and stream height.
- B. Adjust water cooler temperature settings.

### 3.7 CLEANING

- A. After completing fixture installation, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

END OF SECTION 224716



## SECTION 230000 – MECHANICAL SUMMARY OF WORK

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - a. Work covered under Mechanical Contract.
  - b. Work under other contracts.
  - c. Use of premises.
  - d. Owner's occupancy requirements.
  - e. Specification formats and conventions.

- B. Related Sections include the following:

- a. Division 23 Sections.

#### 1.3 WORK COVERED UNDER MECHANICAL CONTRACT

- A. Provide all labor, materials, tools, machinery, equipment, and services necessary to complete the mechanical and DDC work under this contract. All systems and equipment shall be complete in every aspect and all items of material, equipment, and labor shall be provided for a fully operational system. Coordinate the work with work of other trades so as to resolve conflicts without impeding job progress. The mechanical work includes the following:

##### B. MECHANICAL

- 1. The mechanical contractor shall furnish all labor, materials, equipment, rigging, appliances, tools and accessories required for providing, installing, connecting and testing the new mechanical system, associated work, controls, etc., in accordance with these specifications and the applicable drawings. The work includes:
  - a. Remove existing HV/HVAC mechanical equipment as shown on the drawings, complete with associated ductwork, air inlets/outlets, dampers, louvers, piping, valves, insulation, supports, thermostats, electricals, controls, etc.
  - b. Remove existing unit ventilators, complete with existing piping, valves, louvers, insulation, supports, electrical, controls, thermostats, etc.
  - c. Remove existing exhaust fans, roof vents, etc., complete with existing roof curbs, ductwork, air inlets/outlets, supports, electrical, controls, etc.

- d. Remove existing ductwork and air inlets/outlets as called out on plans, complete existing dampers, insulation, supports, etc.
- e. Remove existing abandoned steam radiators, complete with existing enclosures, piping, valves, steam traps, insulation, supports, controls, etc.
- f. Remove existing louvers as called out on the drawings, complete with existing ductwork, dampers, etc. Infill wall openings. Refer to architectural drawings for additional information.
- g. Remove existing piping as called out on the drawings, complete with existing insulation, valves, supports, etc.
- h. Removed all existing controls and wiring associated with demolished mechanical equipment, thermostats, etc.
- i. Remove existing controls on existing mechanical/HV/HVAC units throughout entire school as indicated on the drawings, complete with associated controls, control valves, actuators, thermostats, sensors, etc.
- j. Remove all demolished equipment and debris from the site in accordance with all State and Local regulations.
- k. Coordinate all removals as further scheduled on the drawings so as not to interfere with Owner's use of the building.
- l. Furnish and install new HV/HVAC mechanical equipment as scheduled on the plans, complete with new ductwork, piping, insulation, electrical, etc. for a complete and operational system.
- m. Furnish and install new DX split/heat pump system with indoor/outdoor units as scheduled on the drawings, complete with roof support curbs, supports, fresh air intake ductwork (where indicated on the drawings), refrigerant piping, condensate drain piping, condensate pumps, insulation of all piping/ductwork, valves, gauges, controls, sensors, etc. for a complete and operational system.
- n. **Contractor to note that, hoisting/rigging work needs to be performed after school hours or on a weekend. Coordinate schedule with Owner.**
- o. Furnish and install new unit ventilators, complete with piping, valves, wall boxes, louvers, insulation, supports, wiring, thermostats, electrical, controls, etc. for a complete and operational system. Unit color to be selected by the owner.
- p. Furnish and install exhaust fans complete with supports, vibration isolators, acoustical housing, fan switch, interlock wiring, backdraft dampers, etc. for a complete and operational system
- q. Furnish and install new cabinet heaters, complete with piping, valves, insulation, supports, wiring, thermostats, disconnect switches, DDC controls, etc. for a complete and operational system. Color to be selected by the owner

- r. Furnish and install new exhaust fans complete with supports, vibration isolators, fan switch, interlock wiring, backdraft dampers, etc. for a complete and operational system.
- s. Furnish and install new duct silencers as scheduled on plans.
- t. **All electrical work associated with new HV/HVAC system shall be performed by the Electrical Subcontractor. Refer to electrical drawings and Division 26 specification sections for information.**
- u. All new supply, return, exhaust and outdoor air ductwork shall be internally or externally insulated as indicated on drawings. All internally lined ductwork shall be provided with IAQ liner.
- v. Furnish and install motorized dampers, volume dampers.
- w. Furnish and install flexible duct connectors at all duct connections to all HV/HVAC units.
- x. Provide fire stopping for all duct and piping penetrations through rated walls/slabs with pipe escutcheons
- y. Furnish and install supply and return piping, complete with manual shut-off/temperature balancing valves, check valves, control valves, temperature gauges, union connections, insulation, etc. for a complete operating system. Provide manual isolation valve (on supply) and manual balancing valve (on return) for each terminal unit connection.
- z. Provide automatic and manual air vents at the top of piping risers/headers, at high points in the system.
- aa. All cutting, patching and alteration work shall be performed.
- bb. Furnish and install all ancillary equipment needed for a complete and proper installation including, but not limited to anchors, hangers, expansion loops, fittings, strainers, valves, unions, etc.
- cc. All ductwork shall be properly fabricated, installed and supported as per SMACNA and ASHRAE guidelines
- dd. Contractor to perform testing, adjusting and balancing (TAB) of the entire HV/HVAC system shown on the drawings, including all new HV/HVAC units, air and water side distributions, air outlets/inlets, etc. **Submit four (4) sets of air and unit TAB reports for review.**
- ee. Provide testing, commissioning and start-up reports for all new mechanical/HV system installed in this project.
- ff. The entire new piping system shall be hydrostatically tested for a minimum of two (2) hours at a minimum of 150 psig or 1.5 times the working pressure, whichever is higher. **Submit four (4) sets of pressure testing report for review.**

- gg. Submit six (6) sets of shop drawings of all equipments, sheet metal standards, piping standards, equipment layout, detailed duct and piping layouts, air inlets, supports, DDC controls, electrical, wiring diagram, etc.
- hh. Contractor to prepare as-built drawings of the entire mechanical/HV system. **Submit four (4) sets of Operation and Maintenance Manuals.**
- ii. Contractor to perform testing, adjusting and balancing (TAB) of the entire HVAC/HV/Mechanical system, including all new unit venilstors air side distribution, air outlets/inlets, water side distribution, heating pumps, finned tube elements/baseboards, etc. **Submit four (4) sets of air, water and unit TAB reports for review.**
- jj. Detailed Performance Testing, Adjusting and Balancing (TAB) shall be done during the respective season for the units, during the summer season for cooling mode, during winter for heating mode, and during fall/spring for free cooling mode.
- kk. Provide color coded identification tags, identification markers and equipment tags for all equipment including HVAC units, fans, ductwork, piping, valves, control valves, etc.
- ll. Warranty: The entire system shall be warranted for a period of two (2) complete years from the date of acceptance by the owner, including all materials and labor components.
- mm. **Commissioning:** The following is the commissioning scope of work for this project:
  1. There will not be a separate commissioning agent on this project. The architect/engineer will oversee the commissioning process.
  2. Submittals/Shop Drawings shall include detailed start up procedures.
  3. All equipment shall be factory tested before being shipped to project site.
  4. Perform functional performance test (FPT) of all HV/HVAC systems and equipment. Submit FPT Reports.
  5. Provide detailed Start-Up Reports.
  6. Trending: The building control system/energy management system, shall be monitored for the first year by the Controls Contractor, as well as by the Owner/Owner designated team for proper operation to optimize energy performance without compromising the comfort conditions.
  7. The contractor shall certify in writing that the entire work was completed and systems are operational according to the contract documents, including calibration of instrumentation and controls.
  8. Schedule, witness and document tests, inspections and systems startup. Inform architect/engineer sufficiently in advance to enable them to witness startup.
  9. Perform testing, adjusting and balancing of all airside, waterside, and units/systems.

10. Compile test data, inspection reports and certificates and include them in the Systems Manual and Commissioning Report.
11. Certify date of acceptance and startup for each item of equipment for start of warranty periods.
12. Prepare as-built drawings. Submit four (4) sets of each, along with two (2) CD's (for drawings).
13. Conduct Operation and Maintenance Training Programs, to be provided by qualified instructors for all HV/HVAC systems and equipment. Videotape and edit training sessions. Submit two (2) videotapes for Owners future use and reference.
14. Submit six (6) sets of all documents.

#### 1.4 WORK UNDER OTHER CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

#### 1.5 USE OF PREMISES

- A. General: Each Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - a. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public.
  - b. Driveways and Entrances: Keep driveways parking garage, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of Existing Building: Maintain existing building in a weather tight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

#### 1.6 OWNER'S OCCUPANCY REQUIREMENTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits, unless otherwise indicated.

- a. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
  - b. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
- a. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
  - b. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
  - c. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed.

## 1.7 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the CSI/CSC's "MasterFormat" numbering system.
- a. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
  - b. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
- a. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
  - b. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.8 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 230000



## SECTION 230500 - COMMON WORK RESULTS FOR HVAC

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Transition fittings.
  - 3. Dielectric fittings.
  - 4. Mechanical sleeve seals.
  - 5. Sleeves.
  - 6. Escutcheons.
  - 7. Grout.
  - 8. Mechanical demolition.
  - 9. Equipment installation requirements common to equipment sections.
  - 10. Painting and finishing.
  - 11. Supports and anchorages.

#### 1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for rubber materials:
  - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
  - 2. NBR: Acrylonitrile-butadiene rubber.

#### 1.4 SUBMITTALS

- A. Product Data: For the following:
  - 1. Transition fittings.
  - 2. Dielectric fittings.
  - 3. Mechanical sleeve seals.
  - 4. Escutcheons.
- B. Welding certificates.

#### 1.5 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
  - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
  - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

#### 1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

### 2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

### 2.3 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, **1/8-inch (3.2-mm)** maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, **1/8 inch (3.2 mm)** thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

## 2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for **250-psig (1725-kPa)** minimum working pressure at **180 deg F (82 deg C)**.
  - 1. Acceptable Manufacturers:
    - a. Capitol Manufacturing Co.
    - b. Eclipse, Inc.
    - c. Epco Sales, Inc.
    - d. Hart Industries, International, Inc.
    - e. Watts Industries, Inc.; Water Products Div.
    - f. Zurn Industries, Inc.; Wilkins Div.
    - g. Or Approved Equal.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for **150- or 300-psig (1035- or 2070-kPa)** minimum working pressure as required to suit system pressures.
  - 1. Acceptable Manufacturers:
    - a. Capitol Manufacturing Co.
    - b. Epco Sales, Inc.
    - c. Watts Industries, Inc.; Water Products Div.
    - d. Or Approved Equal.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
  - 1. Acceptable Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Pipeline Seal and Insulator, Inc.
    - d. Or Approved Equal.
  - 2. Separate companion flanges and steel bolts and nuts shall have **150- or 300-psig (1035- or 2070-kPa)** minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and **300-psig (2070-kPa)** minimum working pressure at **225 deg F (107 deg C)**.
  - 1. Acceptable Manufacturers:
    - a. Calpico, Inc.
    - b. Lochinvar Corp.
    - c. Epco Sales, Inc.

- d. Or Approved Equal.
- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
  - 1. Acceptable Manufacturers:
    - a. Perfection Corp.
    - b. Precision Plumbing Products, Inc.
    - c. Sioux Chief Manufacturing Co., Inc.
    - d. Victaulic Co. of America.
    - e. Or Approved Equal.

## 2.5 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
  - 1. Acceptable Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
    - e. Or Approved Equal.
  - 2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 3. Pressure Plates: Stainless steel. Include two for each sealing element.
  - 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## 2.6 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
  - 1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D 1785, Schedule 40.

- G. Molded PE: Reusable, PE, tapered-cup shaped and smooth-outer surface with nailing flange for attaching to wooden forms.

## 2.7 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
  - 1. Finish: Polished chrome-plated and rough brass.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
  - 1. Finish: Polished chrome-plated and rough brass.
- E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw or spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

## 2.8 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

## PART 3 - EXECUTION

### 3.1 MECHANICAL DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
  3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
  4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
  5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
  6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

### 3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:
  - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
  - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
  - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
  - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
  - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
  - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
  - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge and set screw.
  - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
  - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed or exposed-riquet hinge and set screw or spring clips.
  - j. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
  - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
  - l. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
  
2. Existing Piping: Use the following:
  - a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
  - b. Insulated Piping: Split-plate, stamped-steel type with concealed or exposed-riquet hinge and spring clips.
  - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
  - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and spring clips.
  - e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
  - f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and set screw.
  - g. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with polished chrome-plated finish.
  - h. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed or exposed-riquet hinge and set screw or spring clips.
  - i. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.
  - j. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with set screw or spring clips.
  - k. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.
  
- M. Sleeves are not required for core-drilled holes.
- N. Permanent sleeves are not required for holes formed by removable PE sleeves.
- O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas **2 inches (50 mm)** above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  3. Install sleeves that are large enough to provide **1/4-inch (6.4-mm)** annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. PVC Pipe Sleeves: For pipes smaller than **NPS 6 (DN 150)**.
    - b. Steel Sheet Sleeves: For pipes **NPS 6 (DN 150)** and larger, penetrating gypsum-board partitions.
- Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for **1-inch (25-mm)** annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install steel pipe for sleeves smaller than **6 inches (150 mm)** in diameter.
  2. Install cast-iron "wall pipes" for sleeves **6 inches (150 mm)** and larger in diameter.
  3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for **1-inch (25-mm)** annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Fireproofing" for materials.
- T. Verify final equipment locations for roughing-in.
- U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

### 3.4 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping **NPS 2 (DN 50)** and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, in piping **NPS 2-1/2 (DN 65)** and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### 3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

### 3.6 PAINTING

- A. Painting of mechanical systems, equipment, and components is specified in Division 09 Sections "Interior Painting"
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### 3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1.

### 3.8 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

### 3.9 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout around anchors.

G. Cure placed grout.

END OF SECTION 230500

## SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes general requirements for single phase and polyphase, general purpose, horizontal, small and medium, squirrel cage induction motors for use on ac power systems up to 600V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

#### 1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
  - 1. Motor controllers.
  - 2. Torque, speed, and horsepower requirements of the load.
  - 3. Ratings and characteristics of supply circuit and required control sequence.
  - 4. Ambient and environmental conditions of installation location.

### PART 2 - PRODUCTS

#### 2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.
- B. Comply with NEMA MG 1 unless otherwise indicated.
- C. Comply with IEEE 841 for severe duty motors.

#### 2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

#### 2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.

- B. Efficiency: Energy efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
  - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
  - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Multispeed Motors: Separate winding for each speed.
- F. Rotor: Random wound, squirrel cage.
- G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- H. Temperature Rise: Match insulation rating.
- I. Insulation: Class F.
- J. Code Letter Designation:
  - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
  - 2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

#### 2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
  - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse width modulated inverters.
  - 2. Energy and Premium Efficient Motors: Class B temperature rise; Class F insulation.
  - 3. Inverter Duty Motors: Class F temperature rise; Class H insulation.
  - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

#### 2.5 SINGLE PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent split capacitor.
  2. Split phase.
  3. Capacitor start, inductor run.
  4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable torque, permanent split capacitor type.
- C. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513



## SECTION 230519 - METERS AND GAGES FOR HVAC PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Liquid-in-glass thermometers.
  - 2. Thermowells.
  - 3. Dial type pressure gages.
  - 4. Gage attachments.
  - 5. Test plugs.
  - 6. Sight flow indicators.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Certificates: For each type of meter and gage, from manufacturer.
- C. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

### PART 2 - PRODUCTS

#### 2.1 LIQUID-IN-GLASS THERMOMETERS

- A. Metal Case, Industrial Style, Liquid-in-Glass Thermometers:
  - 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. Flo Fab Inc.
    - b. Trerice, H. O. Co.
    - c. Weiss Instruments, Inc.
    - d. Winters Instruments - U.S.
    - e. Or Approved Equal.
  - 2. Standard: ASME B40.200.
  - 3. Case: Cast aluminum; 7 inch nominal size unless otherwise indicated.
  - 4. Case Form: Adjustable angle unless otherwise indicated.
  - 5. Tube: Glass with magnifying lens and blue or red organic liquid.

6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass or plastic.
8. Stem: Aluminum and of length to suit installation.
  - a. Design for Thermowell Installation: Bare stem.
9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

## 2.2 THERMOWELLS

### A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

### B. Heat Transfer Medium: Mixture of graphite and glycerin.

## 2.3 PRESSURE GAGES

### A. Direct Mounted, Metal Case, Dial Type Pressure Gages:

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. AMETEK, Inc.; U.S. Gauge
  - b. Flo Fab Inc.
  - c. Terrice, H. O. Co.

- d. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
  - e. Weiss Instruments, Inc.
  - f. Winters Instruments - U.S.
  - g. Or Approved Equal.
2. Standard: ASME B40.100.
  3. Case: Liquid-filled type(s); cast aluminum or drawn steel; 4-1/2 inch nominal diameter.
  4. Pressure Element Assembly: Bourdon tube unless otherwise indicated.
  5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom outlet type unless back outlet type is indicated.
  6. Movement: Mechanical, with link to pressure element and connection to pointer.
  7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
  8. Pointer: Dark colored metal.
  9. Window: Glass or plastic.
  10. Ring: Metal.
  11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

#### 2.4 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston type surge dampening device. Include extension for use on insulated piping.
- B. Valves: Brass or stainless steel needle, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

#### 2.5 TEST PLUGS

- 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. Flow Design, Inc.
  2. Miljoco Corporation
  3. National Meter, Inc.
  4. Peterson Equipment Co., Inc.
  5. Sisco Manufacturing Company, Inc.
  6. Trerice, H. O. Co.
  7. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
  8. Weiss Instruments, Inc.
  9. Or Approved Equal.
- B. Description: Test station fitting made for insertion into piping tee fitting.
- C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.
- D. Thread Size: NPS ¼ or NPS 1/2, ASME B1.20.1 pipe thread.

- E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.
- F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

## 2.6 TEST PLUG KITS

- 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. Flow Design, Inc.
  - 2. Miljoco Corporation
  - 3. National Meter, Inc.
  - 4. Peterson Equipment Co., Inc.
  - 5. Sisco Manufacturing Company, Inc.
  - 6. Trerice, H. O. Co.
  - 7. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
  - 8. Weiss Instruments, Inc.
  - 9. Or Approved Equal.
- B. Furnish one test plug kit(s) containing one thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.
- C. Low-Range Thermometer: Small, bimetallic insertion type with 1 to 2 inch diameter dial and tapered end sensing element. Dial range shall be at least 25 to 125 deg F.
- D. Pressure Gage: Small, Bourdon tube insertion type with 2 to 3 inch diameter dial and probe. Dial range shall be at least 0 to 200 psig.
- E. Carrying Case: Metal or plastic, with formed instrument padding.

## 2.7 SIGHT FLOW INDICATORS

- 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. Archon Industries, Inc.
  - 2. Dwyer Instruments, Inc.
  - 3. Emerson Process Management; Brooks Instrument
  - 4. Ernst Co., John C., Inc.
  - 5. Ernst Flow Industries
  - 6. KOBOLD Instruments, Inc. - USA; KOBOLD Messring GmbH.
  - 7. OPW Engineered Systems; a Dover company
  - 8. Penberthy; A Brand of Tyco Valves & Controls - Prophetstown
  - 9. Or Approved Equal.
- B. Description: Piping inline installation device for visual verification of flow.
- C. Construction: Bronze or stainless steel body, with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends.
- D. Minimum Pressure Rating: 150 psig.
- E. Minimum Temperature Rating: 200 deg F.

- F. End Connections for NPS 2 and Smaller: Threaded.
- G. End Connections for NPS 2-1/2 and Larger: Flanged.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat transfer medium.
- E. Install direct mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install direct mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- G. Install valve and snubber in piping for each pressure gage for fluids.
- H. Install test plugs in piping tees.
- I. Install flow indicators in piping systems in accessible positions for easy viewing.

#### 3.2 CONNECTIONS

- A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

#### 3.3 ADJUSTING

- A. Adjust faces of meters and gages to proper angle for best visibility.

#### 3.4 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Chilled Water Piping: 0 to 250 deg F.
- B. Scale Range for Heating, Hot Water Piping: 0 to 250 deg F.

#### 3.5 PRESSURE GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Chilled Water Piping: 0 to 100 psi.
- B. Scale Range for Heating, Hot Water Piping: 0 to 100 psi.

END OF SECTION 230519



## SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following general-duty valves:

1. Copper-alloy ball valves.
2. Ferrous-alloy ball valves.
3. Bronze check valves.
4. Ferrous-alloy wafer check valves.
5. Spring-loaded, lift-disc check valves.
6. Bronze gate valves.
7. Cast-iron gate valves.
8. Bronze globe valves.
9. Cast-iron globe valves.

- B. Related Sections include the following:

1. Division 23 Section "Mechanical Identification" for valve tags and charts.
2. Division 23 piping Sections for specialty valves applicable to those Sections only.

#### 1.3 DEFINITIONS

- A. The following are standard abbreviations for valves:

1. CWP: Cold working pressure.
2. EPDM: Ethylene-propylene-diene terpolymer rubber.
3. NBR: Acrylonitrile-butadiene rubber.
4. PTFE: Polytetrafluoroethylene plastic.
5. SWP: Steam working pressure.
6. TFE: Tetrafluoroethylene plastic.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

## 1.5 QUALITY ASSURANCE

- A. ASME Compliance: ASME B31.1 for power piping valves and ASME B31.9 for building services piping valves.
  - 1. Exceptions: Domestic hot- and cold-water piping valves unless referenced.
- B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.
- C. NSF Compliance: NSF 61 for valve materials for potable-water service.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set angle, gate, and globe valves closed to prevent rattling.
  - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
  - 5. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### 2.2 VALVES, GENERAL

- A. Refer to Part 3 "Valve Applications" Article for applications of valves.
- B. Bronze Valves: NPS 2 (DN 50) and smaller with threaded ends, unless otherwise indicated.

- C. Ferrous Valves: NPS 2-1/2 (DN 65) and larger with flanged ends, unless otherwise indicated.
- D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.
- F. Valve Actuators:
  - 1. Chain wheel: For attachment to valves, of size and mounting height, as indicated in the "Valve Installation" Article in Part 3.
  - 2. Gear Drive: For quarter-turn valves NPS 8 (DN 200) and larger.
  - 3. Hand wheel: For valves other than quarter-turn types.
  - 4. Lever Handle: For quarter-turn valves NPS 6 (DN 150) and smaller, except plug valves.
  - 5. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug head.
- G. Extended Valve Stems: On insulated valves.
- H. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.
- I. Valve Grooved Ends: AWWA C606.
  - 1. Solder Joint: With sockets according to ASME B16.18.
    - a. Caution: Use solder with melting point below 840 deg F (454 deg C) for angle, check, gate, and globe valves; below 421 deg F (216 deg C) for ball valves.
  - 2. Threaded: With threads according to ASME B1.20.1.
- J. Valve Bypass and Drain Connections: MSS SP-45.

## 2.3 COPPER-ALLOY BALL VALVES

- A. Available Manufacturers:
- B. Manufacturers:
  - 1. One-Piece, Copper-Alloy Ball Valves:
    - a. American Valve, Inc.
    - b. Conbraco Industries, Inc.; Apollo Div.
    - c. Grinnell Corporation.
    - d. Jamesbury, Inc.
    - e. Kitz Corporation of America.
    - f. Legend Valve & Fitting, Inc.
    - g. NIBCO INC.
    - h. Watts Industries, Inc.; Water Products Div.
    - i. Or Approved Equal.
- C. Copper-Alloy Ball Valves, General: MSS SP-110.

- D. One-Piece, Copper-Alloy Ball Valves: Brass or bronze body with chrome-plated bronze ball, PTFE or TFE seats.

## 2.4 FERROUS-ALLOY BALL VALVES

- A. Available Manufacturers:

- B. Manufacturers:

1. American Valve, Inc.
2. Conbraco Industries, Inc.; Apollo Div.
3. Cooper Cameron Corp.; Cooper Cameron Valves Div.
4. Flow-Tek, Inc.
5. Foster Valve Co.
6. Kitz Corporation of America.
7. KTM Products, Inc.
8. McCANNA, Incorporated.
9. Milwaukee Valve Company.
10. NIBCO INC.
11. PBM, Inc.
12. Richards Industries; Marwin Ball Valves.
13. Worcester Controls.
14. Or Approved Equal.

- C. Ferrous-Alloy Ball Valves, General: MSS SP-72, with flanged ends.

- D. Ferrous-Alloy Ball Valves: Class 150, full or regular port.

## 2.5 BRONZE CHECK VALVES

- A. Available Manufacturers:

- B. Manufacturers:

1. Type 1, Bronze, Horizontal Lift Check Valves with Metal Disc:
  - a. Cincinnati Valve Co.
  - b. Red-White Valve Corp.
  - c. Walworth Co.
  - d. Or Approved Equal.
2. Type 1, Bronze, Vertical Lift Check Valves with Metal Disc:
  - a. Cincinnati Valve Co.
  - b. Crane Co.; Crane Valve Group; Jenkins Valves.
  - c. Red-White Valve Corp.
  - d. Or Approved Equal.
3. Type 3, Bronze, Swing Check Valves with Metal Disc:
  - a. American Valve, Inc.

- b. Cincinnati Valve Co.
- c. Kitz Corporation of America.
- d. Legend Valve & Fitting, Inc.
- e. Milwaukee Valve Company.
- f. NIBCO INC.
- g. Powell, Wm. Co.
- h. Red-White Valve Corp.
- i. Walworth Co.
- j. Watts Industries, Inc.; Water Products Div.
- k. Or Approved Equal.

- C. Bronze Check Valves, General: MSS SP-80.
- D. Type 1, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.
- E. Type 1, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.
- F. Type 3, Class 150, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.

## 2.6 FERROUS-ALLOY WAFER CHECK VALVES

A. Available Manufacturers:

B. Manufacturers:

1. Dual-Plate, Ferrous-Alloy, Wafer-Lug Check Valves:

- a. Crane Co.; Crane Valve Group; Crane Valves.
- b. Gulf Valve Co.
- c. Valve and Primer Corp.
- d. Or Approved Equal.

2. Dual-Plate, Ferrous-Alloy, Double-Flanged-Type Check Valves:

- a. Crane Co.; Crane Valve Group; Crane Valves.
- b. Gulf Valve Co.
- c. Techno Corp.
- d. Or Approved Equal.

C. Ferrous-Alloy Wafer Check Valves, General: API 594, spring loaded.

D. Dual-Plate, Class 125 or 150, Ferrous-Alloy, Double-Flanged Check Valves: Flanged-end body.

## 2.7 SPRING-LOADED, LIFT-DISC CHECK VALVES

A. Available Manufacturers:

B. Manufacturers:

1. Type I, Wafer Lift-Disc Check Valves:
  - a. Mueller Steam Specialty.
  
2. Type II, Compact-Wafer, Lift-Disc Check Valves:
  - a. Durabla Fluid Technology, Inc.
  - b. Flomatic Valves.
  - c. GA Industries, Inc.
  - d. Grinnell Corporation.
  - e. Metraflex Co.
  - f. Milwaukee Valve Company.
  - g. Mueller Steam Specialty.
  - h. Multiplex Manufacturing Co.
  - i. NIBCO INC.
  - j. SSI Equipment, Inc.
  - k. Val-Matic Valve & Mfg. Corp.
  - l. Valve and Primer Corp.
  - m. Or Approved Equal.
  
3. Type III, Globe Lift-Disc Check Valves:
  - a. Durabla Fluid Technology, Inc.
  - b. Flomatic Valves.
  - c. GA Industries, Inc.
  - d. Grinnell Corporation.
  - e. Metraflex Co.
  - f. Milwaukee Valve Company.
  - g. Multiplex Manufacturing Co.
  - h. NIBCO INC.
  - i. SSI Equipment, Inc.
  - j. Val-Matic Valve & Mfg. Corp.
  - k. Valve and Primer Corp.
  - l. Or Approved Equal.
  
4. Type IV, Threaded Lift-Disc Check Valves:
  - a. Check-All Valve Mfg. Co.
  - b. Durabla Fluid Technology, Inc.
  - c. Grinnell Corporation.
  - d. Legend Valve & Fitting, Inc.
  - e. Metraflex Co.
  - f. Milwaukee Valve Company.
  - g. Mueller Steam Specialty.
  - h. NIBCO INC.
  - i. Watts Industries, Inc.; Water Products Div.
  - j. Or Approved Equal.
  
- C. Lift-Disc Check Valves, General: FCI 74-1, with spring-loaded bronze or alloy disc and bronze or alloy seat.
  
- D. Type I, Class 125, Wafer Lift-Disc Check Valves: Wafer style with cast-iron shell with diameter matching companion flanges.

- E. Type II, Class 125, Compact-Wafer, Lift-Disc Check Valves: Compact-wafer style with cast-iron shell with diameter made to fit within bolt circle.
- F. Type III, Class 125, Globe Lift-Disc Check Valves: Globe style with cast-iron shell and flanged ends.
- G. Type IV, Class 125, Threaded Lift-Disc Check Valves: Threaded style with bronze shell and threaded ends.

## 2.8 BRONZE GLOBE VALVES

A. Available Manufacturers:

B. Manufacturers:

1. Type 1, Bronze Globe Valves with Metal Disc:

- a. Cincinnati Valve Co.
- b. Grinnell Corporation.
- c. Kitz Corporation of America.
- d. Legend Valve & Fitting, Inc.
- e. Milwaukee Valve Company.
- f. NIBCO INC.
- g. Powell, Wm. Co.
- h. Red-White Valve Corp.
- i. Walworth Co.
- j. Or Approved Equal.

2. Type 2, Bronze Globe Valves with Nonmetallic Disc:

- a. Cincinnati Valve Co.
- b. Grinnell Corporation.
- c. Kitz Corporation of America.
- d. McWane, Inc.; Kennedy Valve Div.
- e. Milwaukee Valve Company.
- f. NIBCO INC.
- g. Powell, Wm. Co.
- h. Red-White Valve Corp.
- i. Walworth Co.
- j. Or Approved Equal.

3. Type 3, Bronze Globe Valves with Renewable Seat and Metal Disc:

- a. Cincinnati Valve Co.
- b. Grinnell Corporation.
- c. Milwaukee Valve Company.
- d. NIBCO INC.
- e. Walworth Co.
- f. Or Approved Equal.

C. Bronze Globe Valves, General: MSS SP-80, with ferrous-alloy hand wheel.

- D. Type 1, Class 150, Bronze Globe Valves: Bronze body with bronze disc and union-ring bonnet.
- E. Type 3, Class 150, Bronze Globe Valves: Bronze body with bronze disc and renewable seat. Include union-ring bonnet.

## 2.9 CAST-IRON GLOBE VALVES

- A. Available Manufacturers:
- B. Manufacturers:
  - 1. Type I, Cast-Iron Globe Valves with Metal Seats:
    - a. Cincinnati Valve Co.
    - b. Grinnell Corporation.
    - c. Kitz Corporation of America.
    - d. Milwaukee Valve Company.
    - e. NIBCO INC.
    - f. Powell, Wm. Co.
    - g. Red-White Valve Corp.
    - h. Walworth Co.
    - i. Or Approved Equal.
- C. Cast-Iron Globe Valves, General: MSS SP-85.
- D. Type I, Class 125, Cast-Iron Globe Valves: Gray-iron body with bronze seats.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- D. Examine threads on valve and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- F. Do not attempt to repair defective valves; replace with new valves.

### 3.2 VALVE APPLICATIONS

- A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:
  - 1. Shutoff Service: Ball valves.
  - 2. Throttling Service: Ball or globe valves.
  - 3. Pump Discharge: Spring-loaded, lift-disc check valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Heating Water Piping: Use the following types of valves:
  - 1. Ball Valves, NPS 2 (DN 50) and Smaller: One or Two-piece, CWP rating, copper alloy.
  - 2. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
  - 3. Lift Check Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, horizontal / vertical, bronze.
  - 4. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 150, bronze.
  - 5. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
  - 6. Wafer Check Valves, NPS 2-1/2 (DN 65) and Larger: Single / Dual-plate, wafer-lug/ double-flanged, Class 150, ferrous alloy.
  - 7. Spring-Loaded, Lift-Disc Check Valves, NPS 2 (DN 50) and Smaller: Type IV, Class 150.
  - 8. Spring-Loaded, Lift-Disc Check Valves, NPS 2-1/2 (DN 65) and Larger: Class 125, cast iron.
  - 9. Gate Valves, NPS 2 (DN 50) and Smaller: Type 2 / 3, Class 150, bronze.
  - 10. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, OS&Y, bronze-mounted cast iron.
  - 11. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.
  - 12. Globe Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125, bronze-mounted cast iron.

### 3.3 VALVE INSTALLATION

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.
- F. Install chainwheel operators on valves NPS 4 (DN 100) and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor elevation.
- G. Install check valves for proper direction of flow and as follows:
  - 1. Swing Check Valves: In horizontal position with hinge pin level.
  - 2. Dual-Plate Check Valves: In horizontal or vertical position, between flanges.

3. Lift Check Valves: With stem upright and plumb.

#### 3.4 JOINT CONSTRUCTION

- A. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

#### 3.5 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 230523

## SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

##### A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal-hanger shield inserts.
7. Fastener systems.
8. Pipe stands.
9. Equipment supports.

##### B. Related Sections:

1. Section 230548 "Mechanical Vibration and Seismic Controls" for vibration isolation devices.
2. Section 233113 "Metal Ducts" for duct hangers and supports.

#### 1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
  1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
  2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
  3. Design seismic-restraint hangers and supports for piping and equipment.

## 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:
  - 1. Trapeze pipe hangers.
  - 2. Metal framing systems.
  - 3. Fiberglass strut systems.
  - 4. Pipe stands.
  - 5. Equipment supports.
- C. Delegated-Design Submittal: For trapeze hangers 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. Detail fabrication and assembly of trapeze hangers.
  - 2. Design Calculations: Calculate requirements for designing trapeze hangers.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

## 1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

## PART 2 - PRODUCTS

### 2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  - 2. Galvanized Metallic Coatings: Pre-galvanized or hot-dipped.
  - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
  - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
  - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

## 2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

## 2.3 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig (688-kPa) ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or [ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

## 2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, [zinc-coated] [stainless-] steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

## 2.5 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
2. Base: Stainless steel.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

## 2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

## 2.7 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
1. Properties: Nonstaining, noncorrosive, and nongaseous.
  2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

## PART 3 - EXECUTION

### 3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
  2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
  - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
  - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Pipe Stand Installation:
  - 1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
  - 2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb.
- G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- J. Install lateral bracing with pipe hangers and supports to prevent swaying.
- K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- N. Insulated Piping:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
  - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
  - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
  - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
  - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
  - c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
  - d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
  - e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### 3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

### 3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

### 3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting".
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

### 3.5 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
  2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
  3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
  4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
  5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
  6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).
  7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).

8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
  9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
  10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
  11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
  12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
  13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
  14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
  15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
  16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
  17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
  18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction might occur.
  19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
  20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
  21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
  2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
  2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
  3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
  5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
  3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
  6. C-Clamps (MSS Type 23): For structural shapes.
  7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
  8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
  9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
  10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
  11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
  12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    - a. Light (MSS Type 31): 750 lb (340 kg).
    - b. Medium (MSS Type 32): 1500 lb (680 kg).
    - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
  13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
  14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
  15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
  2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).

3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
  4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
  5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
  6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
  7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
  8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
    - a. Horizontal (MSS Type 54): Mounted horizontally.
    - b. Vertical (MSS Type 55): Mounted vertically.
    - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

## SECTION 230548 - MECHANICAL VIBRATION AND SEISMIC CONTROLS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Elastomeric isolation pads and mounts.
  - 2. Restrained elastomeric isolation mounts.
  - 3. Freestanding and restrained spring isolators.
  - 4. Housed spring mounts.
  - 5. Elastomeric hangers.
  - 6. Spring hangers.
  - 7. Spring hangers with vertical-limit stops.
  - 8. Thrust limits.
  - 9. Pipe riser resilient supports.
  - 10. Resilient pipe guides.
  - 11. Freestanding and restrained air spring isolators.
  - 12. Restrained vibration isolation roof-curb rails.
  - 13. Seismic snubbers.
  - 14. Restraining cables.
  - 15. Steel and inertia, vibration isolation equipment bases.

#### 1.3 DEFINITIONS

- A.  $A_v$ : Effective peak velocity related acceleration coefficient.

#### 1.4 SUBMITTALS

- A. Product Data: Include load deflection curves for each vibration isolation device.
- B. Shop Drawings: Include the following:
  - 1. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
  - 2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
  - 3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and

- rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
4. Seismic-Restraint Details: Detail fabrication and attachment of seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.
  5. Submittals for Interlocking Snubbers: Include load deflection curves up to 1/2-inch deflection in x, y, and z planes.
- C. Welding certificates.
- D. Air-Mounting System Performance Certification: Include natural frequency, load, and damping tests performed by an independent laboratory or acoustician.
- E. Manufacturer Seismic Qualification Certification: Submit certification that all specified equipment will withstand seismic forces identified in "Performance Requirements" Article above. Include the following:
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations.
    - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

## 1.5 QUALITY ASSURANCE

- A. Seismic-restraint devices shall have horizontal and vertical load testing and analysis performed according to agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If pre-approved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer. Testing and calculations must include both shear and tensile loads and 1 test or analysis at 45 degrees to the weakest mode.
- B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel."

## 1.6 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into base. Concrete, reinforcement, and formwork requirements are specified in Division 3.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
  2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### 2.2 VIBRATION ISOLATORS

- A. Available Manufacturers:
- B. Manufacturers:
1. Kinetics Noise Control, Inc.
  2. Mason Industries, Inc.
  3. Vibration Eliminator Co., Inc.
  4. Vibration Isolation Co., Inc.
  5. Or Approved Equal.
- C. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.
1. Material: Standard neoprene or Natural rubber.
  2. Number of Layers: Multiple.
- D. Restrained Elastomeric Mounts: All-directional elastomeric mountings with seismic restraint.
1. Materials: Cast-ductile-iron housing containing two separate and opposing, molded, bridge-bearing neoprene elements that prevent central threaded sleeve and attachment bolt from contacting the casting during normal operation.
  2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.
- E. Spring Isolators: Freestanding, laterally stable, open-spring isolators.
1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  3. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
  4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 100 psig.
  6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.
- F. Pipe Riser Resilient Support: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch thick, 60-durometer neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions.
- G. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes separated by a minimum of 1/2-inch thick, 60-durometer neoprene. Factory set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

### 2.3 SEISMIC-RESTRAINT DEVICES

- A. Available Manufacturers:
- B. Manufacturers:
1. Mason Industries, Inc.
  2. Kinetics Noise Control, Inc.
  3. Vibration Eliminator Co., Inc.
  4. Vibration Isolation Co., Inc.
  5. Or Approved Equal.

### 2.4 VIBRATION ISOLATION EQUIPMENT BASES

- A. Available Manufacturers:
- B. Manufacturers:
1. Mason Industries, Inc.
  2. Vibration Eliminator Co., Inc.
  3. Vibration Isolation Co., Inc.
  4. Or Approved Equal.

### 2.5 FACTORY FINISHES

- A. Manufacturer's standard prime-coat finish ready for field painting.
- B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
1. Powder coating on springs and housings.
  2. All hardware shall be electro-galvanized. Hot-dip galvanized metal components for exterior use.
  3. Baked enamel for metal components on isolators for interior use.

4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements, installation tolerances, and other conditions affecting performance.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install seismic snubbers on isolated equipment. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
- B. Install steel angles or channel, sized to prevent buckling, clamped with ductile-iron clamps to hanger rods for trapeze and individual pipe hangers. At trapeze anchor locations, shackle piping to trapeze. Requirements apply equally to hanging equipment. Do not weld angles to rods.
- C. Install resilient bolt isolation washers on equipment anchor bolts.

### 3.3 EQUIPMENT BASES

- A. Fill concrete inertia bases, after installing base frame, with 3000-psi concrete; trowel to a smooth finish.
- B. Concrete Bases: Anchor equipment to concrete base according to supported equipment manufacturer's written instructions for seismic codes at Project site.
  1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
  2. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base and anchor into structural concrete floor.
  3. Place and secure anchorage devices. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  4. Install anchor bolts to elevations required for proper attachment to supported equipment.
  5. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
  6. Cast-in-place concrete materials and placement requirements are specified in Division 3.

### 3.4 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified testing agency to perform the following field quality-control testing:
- B. Testing: Engage a qualified testing agency to perform the following field quality-control testing:
- C. Testing: Perform the following field quality-control testing:
  - 1. Isolator seismic-restraint clearance.
  - 2. Isolator deflection.
  - 3. Snubber minimum clearances.
  - 4. Air-Mounting System Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 5. Air-Mounting System Operational Test: Test the compressed-air leveling system. Remove malfunctioning units, replace with new units, and retest.
  - 6. Test and adjust air-mounting system controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Air-Mounting System Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping connections. Report results in writing.
  - 1. Isolator seismic-restraint clearance.
  - 2. Isolator deflection.
  - 3. Snubber minimum clearances.
  - 4. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 5. Operational Test: Test the compressed-air leveling system. Remove malfunctioning units, replace with new units, and retest.
  - 6. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### 3.5 ADJUSTING

- A. Adjust isolators after piping systems have been filled and equipment is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop.
- D. Adjust air spring leveling mechanism.
- E. Adjust active height of spring isolators.
- F. Adjust snubbers according to manufacturer's written recommendations.
- G. Adjust seismic restraints to permit free movement of equipment within normal mode of operation.

- H. Torque anchor bolts according to equipment manufacturer's written recommendations to resist seismic forces.

### 3.6 CLEANING

- A. After completing equipment installation, inspect vibration isolation and seismic-control devices. Remove paint splatters and other spots, dirt, and debris.

### 3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-mounting systems. Refer to Division 1 Section "Closeout Procedures"

END OF SECTION 230548



## SECTION 230553 - MECHANICAL IDENTIFICATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following mechanical identification materials and their installation:
  - 1. Equipment nameplates.
  - 2. Equipment markers.
  - 3. Equipment signs.
  - 4. Access panel and door markers.
  - 5. Pipe markers.
  - 6. Duct markers.
  - 7. Stencils.
  - 8. Warning tags.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Valve numbering scheme.

#### 1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

#### 1.5 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with location of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT IDENTIFICATION DEVICES

- A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
  - 1. Data:
    - a. Manufacturer, product name, model number, and serial number.
    - b. Capacity, operating and power characteristics, and essential data.
    - c. Labels of tested compliances.
  - 2. Location: Accessible and visible.
  - 3. Fasteners: As required to mount on equipment.
- B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
  - 1. Terminology: Match schedules as closely as possible.
  - 2. Data:
    - a. Name and plan number.
    - b. Equipment service.
    - c. Design capacity.
    - d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
  - 3. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.
- C. Equipment Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
  - 1. Data: Instructions for operation of equipment and for safety procedures.
  - 2. Engraving: Manufacturer's standard letter style, of sizes and with terms to match equipment identification.
  - 3. Thickness: 1/8 inch, unless otherwise indicated.
  - 4. Thickness: 1/16 inch for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.
  - 5. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.
- D. Access Panel and Door Markers: 1/16-inch thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch center hole for attachment.
  - 1. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

## 2.2 PIPING IDENTIFICATION DEVICES

- A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.
  - 1. Colors: Comply with ASME A13.1, unless otherwise indicated.
  - 2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
  - 3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
  - 4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
  - 5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
- B. Pre-tensioned Pipe Markers: Precoiled semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.
- C. Shaped Pipe Markers: Preformed semi-rigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.
- D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.
- E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils thick with pressure-sensitive, permanent-type, self-adhesive back.
  - 1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.
  - 2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

## 2.3 DUCT IDENTIFICATION DEVICES

- A. Duct Markers: Engraved, color-coded laminated plastic. Include direction and quantity of airflow and duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive.

## 2.4 STENCILS

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door markers, equipment markers, equipment signs, and similar operational instructions.
  - 1. Stencil Material: Metal or fiberboard, Aluminum, or Brass.
  - 2. Stencil Paint: Exterior, gloss, acrylic enamel black, unless otherwise indicated. Paint may be in pressurized spray-can form.
  - 3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1, unless otherwise indicated.

## 2.5 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme approved by Architect. Provide 5/32-inch hole for fastener.
1. Material: 0.032-inch thick brass or aluminum.
  2. Material: 0.0375-inch thick stainless steel.
  3. Material: 3/32-inch thick laminated plastic with 2 black surfaces and white inner layer.
  4. Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook.

## 2.6 VALVE SCHEDULES

- A. Valve Schedules: For each piping system, on standard-size bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
1. Valve-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws.
  2. Frame: Extruded aluminum.
  3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

## 2.7 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card stock with matte finish suitable for writing.
1. Size: 3 by 5-1/4 inches minimum.
  2. Fasteners: Brass grommet and wire.
  3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.
  4. Color: Yellow background with black lettering.

## PART 3 - EXECUTION

### 3.1 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other Division 23 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

### 3.2 EQUIPMENT IDENTIFICATION

- A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where

not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:

1. Fuel-burning units, including boilers, furnaces, heaters, and stills.
2. Pumps, and similar motor-driven units.
3. Heat exchangers, coils, evaporators, and similar equipment.
4. Fans, blowers, primary balancing dampers, and mixing boxes.
5. Packaged HV/HVAC (central-station and zone-type units), split HV/HVAC, indoor AHU's, etc.

B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.

1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:
  - a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
  - b. Meters, gages, thermometers, and similar units.
  - c. Fuel-burning units, including boilers, furnaces, and heaters.
  - d. Pumps and similar motor-driven units.
  - e. Heat exchangers, coils, and similar equipment.
  - f. Fans, blowers, primary balancing dampers, and mixing boxes.
  - g. Packaged HV/HVAC (central-station and zone-type units), split HV/HVAC, indoor AHU's, etc.
  - h. Strainers, filters, water-treatment systems, and similar equipment.

C. Stenciled Equipment Marker Option: Stenciled markers may be provided instead of laminated-plastic equipment markers, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.

D. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.

1. Identify mechanical equipment with equipment markers in the following color codes:
  - a. Green: For cooling equipment and components.
  - b. Yellow: For heating equipment and components.
  - c. Green and Yellow or Orange: For combination cooling and heating equipment and components.
2. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
3. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.

4. Include signs for the following general categories of equipment:
  - a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
  - b. Fuel-burning units, including boilers, furnaces, and heaters.
  - c. Pumps and similar motor-driven units.
  - d. Heat exchangers, coils, evaporators, and similar equipment.
  - e. Fans, blowers, primary balancing dampers, and mixing boxes.
  - f. Packaged HV/HVAC (central-station and zone-type units), split HV/HVAC, indoor AHU's, etc.
  - g. Strainers, filters, water-treatment systems, and similar equipment.
- E. Stenciled Equipment Sign Option: Stenciled signs may be provided instead of laminated-plastic equipment signs, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.
- F. Install access panel markers with screws on equipment access panels.

### 3.3 PIPING IDENTIFICATION

- A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
  1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pre-tensioned pipe markers. Use size to ensure a tight fit.
  2. Pipes with OD, Including Insulation, Less Than 6 Inches: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape at least 3/4 inch wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.
- B. Stenciled Pipe Marker Option: Stenciled markers may be provided instead of manufactured pipe markers, at Installer's option. Install stenciled pipe markers with painted, color-coded bands or rectangles complying with ASME A13.1 on each piping system.
  1. Identification Paint: Use for contrasting background.
  2. Stencil Paint: Use for pipe marking.
- C. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:
  1. Near each valve and control device.
  2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.
  4. At access doors, manholes, and similar access points that permit view of concealed piping.
  5. Near major equipment items and other points of origination and termination.
  6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
  7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

### 3.4 DUCT IDENTIFICATION

- A. Install duct markers with permanent adhesive on air ducts in the following color codes:
  - 1. Green: For cold-air supply ducts.
  - 2. Yellow: For hot-air supply ducts.
  - 3. Blue: For exhaust, outside, relief, return, and mixed-air ducts.
  - 4. ASME A13.1 Colors and Designs: For hazardous material exhaust.
  - 5. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- B. Stenciled Duct Marker Option: Stenciled markers, showing service and direction of flow, may be provided instead of laminated-plastic duct markers, at Installer's option, if lettering larger than 1-inch high is needed for proper identification because of distance from normal location of required identification.
- C. Locate markers near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

### 3.5 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

### 3.6 ADJUSTING

- A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

### 3.7 CLEANING

- A. Clean faces of mechanical identification devices and glass frames of valve schedules.

END OF SECTION 230553



## SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Balancing Air Systems:
    - a. Constant-volume air systems.
  - 2. Balancing Hydronic Piping Systems:
    - a. Constant-flow hydronic systems.
  - 3. Additional Tests
    - a. Sound testing.
    - b. Vibration testing.
    - c. Duct leakage testing.
    - d. Controls verification.

#### 1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. T&B: Testing, adjusting, and balancing
- C. T&B Agency: An independent entity certified by AABC to perform testing and balancing work.
- D. TBE: AABC certified test and balance engineer.
- E. TBT: AABC certified test and balance technician.
- F. HVAC: Heating, ventilating, and air conditioning.
- G. BAS: Building automation systems.
- H. Contract documents: the mechanical drawings and test and balance specification
- I. NC: noise criteria

J. RC: room criteria

#### 1.4 T&B INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation T&B of AABC certification of T&B agency and personnel, including a sample copy of the AABC "National Performance Guaranty." If not submitted within the timeframe specified, the engineer has the right to choose an AABC agency at the Contractor's expense.
- B. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit T&B strategies and step-by-step procedures as specified in "Preparation" Article.
- C. System Readiness Checklists: Within 30 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article to be used and filled out by systems Installers verifying that systems are ready for T&B.
- D. Examination Report: Within 30 days of Contractor's Notice to Proceed, provide a summary report of the examination review required in Part 3 "Examination", if issues are discovered that may preclude the proper testing and balancing of the systems.
- E. Certified T&B reports: Within 14 days of completion of balancing work, submit AABC-certified T&B report.
  - 1. Submit one copy of the final T&B Report directly to the design professional of record. Provide five additional copies to the contractor.

#### 1.5 QUALITY ASSURANCE

- A. T&B Agency Qualifications: Engage a T&B entity certified by AABC.
  - 1. T&B Field Supervisor: Employee of the T&B Agency who is certified by AABC.
  - 2. T&B Technician: Employee of the T&B Agency and who is certified by AABC as a TBT.
- B. T&B Conference: If requested by the Engineer or Owner after approval of the T&B Agency's submittals, meet to develop a mutual understanding of the details. The T&B agency shall be provided a minimum of 14 days' advance notice of scheduled meeting time and location.
  - 1. Agenda Items:
    - a. The examination report.
    - b. The Strategies and Procedures plan.
    - c. Systems readiness checklists.
    - d. Coordination and cooperation of trades and subcontractors.
    - e. Coordination of documentation and communication flow.
- C. TBT shall perform the following:
  - 1. Review field data reports to validate accuracy of data and to prepare certified T&B reports.
  - 2. Certify that the T&B team complied with the approved T&B plan and the procedures specified and referenced in this Specification.

3. Certify the T&B report.

D. T&B Report Forms: Use approved forms submitted with the Strategies and Procedures Plan.

E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in the "AABC National Standards for Total System Balance."

#### 1.6 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire T&B period. Cooperate with Owner during T&B operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during T&B operations to minimize conflicts with Owner's operations.

#### PART 2 - PRODUCTS (Not Applicable)

#### PART 3 - EXECUTION

##### 3.1 T&B AGENCY

A. Subject to compliance with requirements, engage one of AABC certified T&B Agencies:

##### 3.2 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper T&B of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Note the locations of devices that are not accessible for testing and balancing.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

E. Examine equipment performance data including fan and pump curves.

F. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, clean permanent filters are installed, and equipment with functioning controls is ready for operation.

G. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected, configured by the controls contractor, and functioning.

- H. Examine strainers to verify that mechanical contractor has replaced startup screens with permanent screens and that all strainers have been cleaned.
- I. Examine two-way valves for proper installation and function.
- J. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- L. Examine air vents to verify that mechanical contractor has removed all air from all hydronic systems.

### 3.3 PREPARATION

- A. Prepare a T&B plan that includes the following:
  - 1. Equipment and systems to be tested.
  - 2. Strategies and step-by-step procedures for balancing the systems.
  - 3. Instrumentation to be used.
  - 4. Sample forms with specific identification for all equipment.
- B. Prepare system-readiness checklists, as described in the "AABC National Standards for Total System Balance," for use by systems installers in verifying system readiness for T&B. These shall include, at a minimum, the following:
  - 1. Airside:
    - a. Ductwork is complete with terminals installed.
    - b. Volume, smoke and fire dampers are open and functional.
    - c. Clean filters are installed.
    - d. Fans are operating, free of vibration, and rotating in correct direction.
    - e. Variable-frequency controllers' start-up is complete and safeties are verified.
    - f. Automatic temperature-control systems are operational.
    - g. Ceilings are installed.
    - h. Windows and doors are installed.
    - i. Suitable access to balancing devices and equipment is provided.
  - 2. Hydronics:
    - a. Piping is complete with terminals installed.
    - b. Water treatment is complete.
    - c. Systems are flushed, filled and air purged.
    - d. Strainers are pulled and cleaned.
    - e. Control valves are functioning per the sequence of operation.
    - f. Shutoff and balance valves have been verified to be 100 percent open.
    - g. Pumps are started and proper rotation is verified.
    - h. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
    - i. Variable-frequency controllers' start-up is complete and safeties are verified.
    - j. Suitable access to balancing devices and equipment is provided.

### 3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for T&B procedures.
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

### 3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain approved submittals and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare single-line schematic diagram of systems for the purpose of identifying HVAC components.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check condensate drains for proper connections and functioning.
- H. Check for proper sealing of air-handling-unit components.

### 3.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
  - 1. Measure total airflow.
    - a. Set outside air, return air and relief air dampers for proper position that simulates minimum outdoor air conditions.
    - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
    - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
    - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

2. Measure fan static pressures as follows:
    - a. Measure static pressure directly at the fan outlet or through the flexible connection.
    - b. Measure static pressure directly at the fan inlet or through the flexible connection.
    - c. Measure static pressure across each component that makes up the air-handling system.
    - d. Report any artificial loading of filters at the time static pressures are measured.
  3. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
1. Measure airflow of submain and branch ducts.
  2. Adjust sub-main and branch duct volume dampers for specified airflow.  
Re-measure each sub-main and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
  2. Measure airflow at all inlets and outlets.
  3. Adjust each inlet and outlet for specified airflow.
  4. Re-measure each inlet and outlet after all have been adjusted.
- D. Verify final system conditions.
1. Re-measure and confirm minimum outdoor air, return and relief airflows are within design. Readjust to design if necessary.
  2. Re-measure and confirm total airflow is within design.
  3. Re-measure all final fan operating data, rpms, volts, amps, static profile.
  4. Mark all final settings.
  5. Test system in economizer mode. Verify proper operation and adjust, if necessary.
  6. Measure and record all operating data.
  7. Record final fan-performance data.

### 3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports for pumps, coils and heat exchangers. Obtain approved submittals and any manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.
- B. Verify that hydronic systems are ready for testing and balancing:
1. Check liquid level in expansion tank.
  2. Check that makeup water-has adequate pressure to highest vent.
  3. Check that control valves are in their proper position.
  4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
  5. Verify that motor starters are equipped with properly sized thermal protection.

6. Check that air has been purged from the system.

### 3.8 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

- A. Adjust pumps to deliver total design gpm.
  1. Measure total water flow.
    - a. Position valves for full flow through coils.
    - b. Measure flow by main flow meter, if installed.
    - c. If main flow meter is not installed determine flow by pump total dynamic head (TDH) or exchanger pressure drop.
  2. Measure pump TDH as follows:
    - a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
    - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
    - c. Convert pressure to head and correct for differences in gauge heights.
    - d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
    - e. With all valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
  3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
- B. Adjust flow measuring devices installed in mains and branches to design water flows.
  1. Measure flow in main and branch pipes.
  2. Adjust main and branch balance valves for design flow.
  3. Re-measure each main and branch after all have been adjusted.
- C. Adjust flow measuring devices installed at terminals for each space to design water flows.
  1. Measure flow at all terminals.
  2. Adjust each terminal to design flow.
  3. Re-measure each terminal after all have been adjusted.
  4. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
  5. Perform temperature tests after all flows have been balanced.
- D. For systems with pressure-independent valves at the terminals:
  1. Measure differential pressure and verify that it is within manufacturer's specified range.
  2. Perform temperature tests after all flows have been verified.
- E. For systems without pressure-independent valves or flow measuring devices at the terminals:
  1. Measure and balance coils by either coil pressure drop or temperature method.

2. If balanced by coil pressure drop, perform temperature tests after all flows have been verified.

F. Verify final system conditions as follows:

1. Re-measure and confirm that total water flow is within design.
2. Re-measure all final pumps' operating data, TDH, volts, amps, static profile.
3. Mark all final settings.

G. Verify that all memory stops have been set.

### 3.9 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Phse/Hertz (Hz)
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter size and thermal-protection-element rating.
8. Service factor and frame size.

B. Motors Driven by Variable-Frequency Controllers: Test the manual bypass of the controller to prove proper operation.

### 3.10 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop for major (more than 20 gpm) equipment coils, excluding unitary equipment such as reheat coils, unit heaters, fan-coil units, etc.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each steam coil:

1. Dry-bulb temperature of entering and leaving air.

2. Airflow.
3. Inlet steam pressure.

D. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.

### 3.11 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.
4. Cooling-Water Flow Rate: Plus or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

### 3.12 FINAL TEST AND BALANCE REPORT

A. The report shall be a complete record of the HVAC system performance, including conditions of operation, items outstanding, and any deviations found during the T&B process. The final report also provides a reference of actual operating conditions for the owner and/or operations personnel. All measurements and test results that appear in the reports must be made on site and dated by the AABC technicians or test and balance engineers.

B. The report must be organized by systems and shall include the following information as a minimum:

1. Title Page:
  - a. AABC certified company name
  - b. Company address
  - c. Company telephone number
  - d. Project identification number
  - e. Location
  - f. Project Architect
  - g. Project Engineer
  - h. Project Contractor
  - i. Project number
  - j. Date of report
  - k. AABC Certification Statement
  - l. Name, signature, and certification number of AABC TBE
2. Table of Contents.
3. AABC National Performance Guaranty.
4. Report Summary:

- a. The summary shall include a list of items that do not meet design tolerances, with information that may be considered in resolving deficiencies.
- 5. Instrument List:
  - a. Type.
  - b. Manufacturer.
  - c. Model.
  - d. Serial Number.
  - e. Calibration Date.
- 6. T&B Data:
  - a. Provide test data for specific systems and equipment as required by the most recent edition of the "AABC National Standards."
- C. One copy of the final test and balance report shall be sent directly to the engineer of record. Provide five additional copies to the contractor.

### 3.13 VERIFICATION OF T&B REPORT

- A. Final Verification:
  - 1. After testing and balancing is complete and accurately documented in the final report, request that a final verification be made by Engineer.
  - 2. The T&B Agency shall conduct the verification in the presence of Engineer.
  - 3. Engineer shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
  - 4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
  - 5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final verification, the testing and balancing shall be considered incomplete.

### 3.14 REVERIFICATION

- A. T&B Agency shall recheck all measurements and make adjustments as required to complete the balancing. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second verification.
- B. If the second verification also fails, Owner/Engineer may contact AABC Headquarters regarding the AABC National Performance Guaranty.

### 3.15 ADDITIONAL TESTS

- A. Sound Testing

1. After the systems are balanced and the spaces are architecturally complete, read and record sound levels at 10 locations as designated by the Engineer of record.
2. Instrumentation:
  - a. The sound-testing meter shall be a portable, general-purpose testing meter consisting of a microphone, processing unit, and readout.
  - b. The sound-testing meter shall be capable of showing fluctuations at minimum and maximum levels, and measuring the equivalent continuous sound pressure level (LEQ).
  - c. The sound-testing meter must be capable of using 1/3 octave band filters to measure mid-frequencies from 31.5 HZ to 8000 HZ.
  - d. The accuracy of the sound-testing meter shall be  $\pm 1$  decibel.
3. Test Procedures
  - a. Perform test at the quietest background noise period. Note any cause of unpreventable sound that may affect the test outcome.
  - b. Equipment should be operating at design values.
  - c. Calibrate the sound-testing meter prior to taking measurements.
  - d. Use a microphone suitable for the type of noise levels measured that is compatible with the meter. Provide a windshield for outside or in-duct measurements.
  - e. Record a set of background measurements in dB(A), and sound pressure levels in the eight un-weighted octave bands [63 HZ to 8000 HZ (NC)] with the equipment off.
  - f. Take sound readings in dB(A), and sound pressure levels in the eight un-weighted octave bands [63 HZ to 8000 HZ (NC)] with the equipment on.
  - g. Take readings no closer than 3' from a wall or from the operating equipment, and approximately 5' from the floor, with the meter held or mounted on a tripod.
  - h. For outdoor measurements, move the sound-testing meter slowly and scan the area that has the greatest exposure to the noise source being tested. (This type of reading is generally performed using the A-Weighted scale).
4. Reporting
  - a. The report must record: the location, the system tested, the dB(A) reading, and the sound pressure level in each octave band with equipment on and off.
  - b. Plot all the sound pressure levels on the NC work sheet, with the equipment on and off.

B. Vibration Testing:

1. After the systems are balanced and the spaces are architecturally complete, read and record vibration levels on all equipment with motor horsepower equal to or greater than 10 hp.
2. Instrumentation:
  - a. The vibration meter should be portable, battery-operated, and microprocessor-controlled, with or without a built-in printer.
  - b. The meter shall automatically identify engineering units, filter bandwidth, amplitude and frequency scale values.
  - c. The meter shall be able to measure machine vibration displacement in mils of deflection, velocity in inches per second, and acceleration in inches per second squared.

3. Test Procedures:

- a. Verify that the vibration meter calibration date is current before taking readings.
- b. To ensure accurate readings, verify that the accelerometer has a clean, flat surface and is mounted properly.
- c. With the unit running, set up the vibration meter in a safe, secure location. Connect the transducer to the meter with the proper cables. Hold the magnetic tip of the transducer on top of the bearing, and measure the unit in mils of deflection. Record the measurement, then move the transducer to the side of the bearing, and record in mils of deflection. Record an axial reading in mils of deflection by holding the nonmagnetic, pointed transducer tip on the end of the shaft.
- d. Change the vibration meter to velocity (inches per second) measurements. Repeat and record the above measurements.
- e. Record the CPM or the RPM.
- f. Read each bearing on the motor, fan, and/or pump as required. Track and record vibration levels from the rotating component through the casing to the base.

4. Reporting

- a. The report must record the location and the system tested.
- b. Include horizontal-vertical-axial measurements for all tests.
- c. Verify that vibration limits follow specifications, or, if not specified, follow the "General Machinery Vibration Severity Chart" or "Vibration Acceleration General Severity Chart" from the AABC National Standards. Acceptable levels of vibration are normally "Smooth" to "Good."
- d. Include in the report the Machinery Vibration Severity Chart, with conditions plotted.

C. Duct Leakage Testing:

1. Witness the duct pressure testing performed by the mechanical/installing contractor.
2. Verify that proper test methods are used and that leakage rates are within specified tolerances.
3. Report any deficiencies observed.

D. Controls Verification

1. In conjunction with system balancing perform the following:
  - a. Work with the temperature control contractor to ensure the system is operating within the design limitations, and gain a mutual understanding of intended control performance.
  - b. Confirm that the sequences of operation are in compliance with the approved drawings.
  - c. Verify that controllers are calibrated and function as intended.
  - d. Verify that controller setpoints are as specified.
  - e. Verify the operation of lockout or interlock systems.
  - f. Verify the operation of all valve and damper actuators.
  - g. Verify that all controlled devices are properly installed and connected to the correct controller.
  - h. Verify that all controlled devices travel freely and are in the position indicated by the controller: open, closed, or modulating.
  - i. Verify the location and installation of all sensors to ensure they will sense only the intended temperatures, humidities, or pressures.

2. Reporting

- a. The report shall include a summary of verifications performed, remaining deficiencies, and any variations from specified conditions.

END OF SECTION 230593



## SECTION 230713 - DUCT INSULATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes insulating the following duct services:
  - 1. Indoor, concealed supply, return & exhaust air.
  - 2. Indoor, concealed ductwork located in unconditioned space.
- B. Related Sections:
  - 1. Section 230719 "Piping Insulation."

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
  - 2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
  - 3. Detail application of field-applied jackets.
  - 4. Detail application at linkages of control devices.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

## 1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

## 1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 INSULATION MATERIALS

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

- C. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, factory-applied FSK jacket/FSP jacket]. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

## 2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
  - 1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Adhesive 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."
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
  - 1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Adhesive 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."

## 2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
  - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
  - 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
  - 2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
  - 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
  - 4. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.
  - 1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.03 metric perm) at 35-mil (0.9-mm) dry film thickness.
  - 2. Service Temperature Range: 0 to 180 deg F (Minus 18 to plus 82 deg C).
  - 3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
  - 4. Color: White.

## 2.4 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
  3. Service Temperature Range: 0 to plus 180 deg F (Minus 18 to plus 82 deg C).
  4. Color: White.

## 2.5 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
  2. Fire- and water-resistant, flexible, elastomeric sealant.
  3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
  4. Color: Aluminum.
  5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  6. Sealants 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."
- B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
  2. Fire- and water-resistant, flexible, elastomeric sealant.
  3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
  4. Color: White.
  5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  6. Sealants 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."

## 2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
  2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
  3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
  4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.

5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms (0.86 metric perm) when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

## 2.7 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
  1. Width: 3 inches (75 mm).
  2. Thickness: 11.5 mils (0.29 mm).
  3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
  4. Elongation: 2 percent.
  5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
  6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
  1. Width: 3 inches (75 mm).
  2. Thickness: 6.5 mils (0.16 mm).
  3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
  4. Elongation: 2 percent.
  5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
  6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
  1. Width: 2 inches (50 mm).
  2. Thickness: 6 mils (0.15 mm).
  3. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
  4. Elongation: 500 percent.
  5. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
  1. Width: 2 inches (50 mm).
  2. Thickness: 3.7 mils (0.093 mm).
  3. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
  4. Elongation: 5 percent.
  5. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

## 2.8 SECUREMENTS

- A. Bands:
  1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, [Type 304] [or] [Type 316]; 0.015 inch (0.38 mm) thick, [1/2 inch (13 mm)] [3/4 inch (19 mm)] wide with [wing seal] [or] [closed seal].
  2. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, [1/2 inch (13 mm)] [3/4 inch (19 mm)] wide with [wing seal] [or] [closed seal].

3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.
- B. Insulation Pins and Hangers:
1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- (3.5-mm-) diameter shank, length to suit depth of insulation indicated.
  2. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
    - a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
    - b. Spindle: Copper- or zinc-coated, low-carbon steel/Aluminum, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
    - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
  3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick, galvanized-steel/aluminum sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.
    - a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.
- D. Wire: 0.080-inch (2.0-mm) soft-annealed, galvanized steel.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.
    - a. For below ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
  - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

### 3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
  - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).
  - 1. Comply with requirements in **Section 078413 "Penetration Firestopping"** for firestopping.

### 3.5 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
  - 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
  - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
  - 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    - a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
    - b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation

- joints. Install additional pins to hold insulation tightly against surface at cross bracing.
- c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
  - d. Do not overcompress insulation during installation.
  - e. Impale insulation over pins and attach speed washers.
  - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
    - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    - b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).
  5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.
  6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
  7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

### 3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
  1. Inspect ductwork, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

### 3.7 FINISHES

- A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below.
  - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
    - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

### 3.8 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
  - 1. Indoor, concealed supply and outdoor air.
  - 2. Indoor, exposed supply and outdoor air.
  - 3. Indoor, concealed return located in nonconditioned space.
  - 4. Indoor, exposed return located in nonconditioned space.
  - 5. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
  - 6. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
- B. Items Not Insulated:
  - 1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
  - 2. Factory-insulated flexible ducts.
  - 3. Factory-insulated plenums and casings.
  - 4. Flexible connectors.
  - 5. Vibration-control devices.
  - 6. Factory-insulated access panels and doors.

### 3.9 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, supply-air, return-air, exhaust-air and outdoor-air duct insulation shall be the following:
  - 1. Mineral Fiber Blanket: Minimum R-6, 2 inches thick, and minimum 1 lb. density.
- B. Exposed, supply-air, return-air, exhaust-air and outdoor-air duct insulation shall be the following:
  - 1. Mineral Fiber Blanket: Minimum R-6, 2 inches thick, and minimum 1 lb. density.

END OF SECTION 230713

## SECTION 230714 - ACOUSTIC DUCT INSULATION

### PART 1 – GENERAL

#### 1.01 SCOPE

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required, for correct fabrication and installation of fibrous glass duct liner in sheet metal ducts in accordance with applicable project drawings and specifications, subject to terms and conditions of the contract:
  - 1. All air duct systems operating at internal air velocities not exceeding rated duct liner limitations as listed below, and internal air temperatures not exceeding 250°F.
- B. The finished duct system shall meet the requirements of NFPA 90A and 90B.
- C. Dimensions shown on the plans are finished inside dimensions.
- D. Fabrication and installation shall conform to manufacturer's recommendations and to the requirements of the latest edition of North American Insulation Manufacturers Association (NAIMA) Fibrous Glass Duct Liner Standards, hereinafter referred to as NAIMA FGDLS, and/or Sheet Metal and Air Conditioning Contractors National Association (SMACNA) Standard, HVAC Duct Construction Standards – Metal and Flexible, hereinafter referred to as SMACNA HVAC DCS.

#### 1.02 REFERENCES

- A. Duct liner insulation materials shall meet the requirements of the following:
  - 1. American Society for Testing and Materials specifications:
    - a. ASTM C 1071, Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material).

#### 1.03 DELIVERY AND STORAGE OF MATERIALS

- A. Deliver all materials and/or fabricated, insulated duct sections and fittings to the job site and store in a safe, dry place.
- B. Use all means necessary at the job site to protect materials from dust, dirt, moisture and physical abuse before and during installation.

#### 1.04 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

## PART 2 – PRODUCTS

### 2.01 INSULATED DUCT SYSTEM

- A. All supply ducts, return ducts and related fittings shall be insulated with one of the following as designated on project plans and specifications:

1. Owens Corning QuietR® Textile Duct Liner, for service at internal air velocities not to exceed 6,000 fpm:

- a. Type 200, 1-1/2" thick.

The duct liner shall have a black pigmented coating on the airstream side to resist damage during installation and in service. Edges shall be factory coated with the same black pigmented coating to comply with SMACNA HVAC DCS.

2. Owens Corning QuietR® Rotary Duct Liner, for service at internal air velocities not to exceed 6,000 fpm (30.5 m/s):

- a. Type R-6, 1-1/2" (38mm) thick.

The duct liner shall have a black pigmented coating on the airstream side to resist damage during installation and in service. Edges shall be factory coated with the same black pigmented coating to comply with SMACNA HVAC DCS.

3. Owens Corning Quiet® Duct Liner Board, for service at internal air velocities not to exceed 6,000 fpm (30.5 m/s):

- a. 3.0 pcf (48 kg/m<sup>3</sup>) density, 1-1/2" thick.

The duct liner shall have a black pigmented mat on the airstream side to resist damage during installation and in service. Edges shall be factory coated with black pigmented coating to comply with SMACNA HVAC DCS requirements.

## PART 3 – EXECUTION

### 3.01 INSPECTION

- A. Verify that the duct liner product may be installed in accordance with project drawings, operating performance parameters and limitations, and NAIMA FGDLS or SMACNA HVAC DCS.

### 3.02 INSULATION OF STRAIGHT DUCT AND FITTINGS

- A. All portions of duct designated to receive duct liner shall be completely covered with duct liner. Transverse joints shall be neatly butted and there shall be no interruptions or gaps. The black pigmented or mat faced surface of the duct liner shall face the airstream.
- B. Duct liner shall be adhered to the sheet metal with 90% coverage of adhesive complying with requirements of ASTM C 916. All exposed leading edges and transverse joints shall be factory coated or coated with adhesive during fabrication.

- C. Duct liner shall be additionally secured with mechanical fasteners, either weld-secured or impact-driven, which shall compress the duct liner sufficiently to hold it firmly in place. Adhesive bonded pins are not permitted due to long-term adhesive aging characteristics.

Spacing of mechanical fasteners with respect to duct liner interior width shall be in accordance with SMACNA HVAC DCS. Maximum spacing for mechanical fasteners shall be as follows:

Velocity = 0 to 2,500 feet per minute (0 to 12.8 m/s):

From transverse end of liner 3" (75mm)

Across width of duct 12" (300mm) O.C.

From corners of duct 4" (100mm)

Along length of duct 18" (450mm) O.C.

Velocity = 2,501 to 5,000 feet per minute  
(12.8 to 25.4 m/s):

From transverse end of liner 3" (75mm)

Across width of duct 6" (150mm) O.C.

From corners of duct 4" (100mm)

Along length of duct 16" (400mm) O.C.

- D. QuietR® Duct Liner products shall be cut to assure overlapped and compressed longitudinal corner joints.
- E. Quiet R® Duct Liner board shall be cut to assure tight, over-lapped corner joints. The top pieces of liner board shall be supported at the edges by the side pieces.

### 3.03 INSPECTION

- A. Upon completion of installation of duct liner and before operation is to commence, visually inspect the system and verify that the duct liner insulation has been correctly installed.
- B. Open all system dampers and turn on fans to blow all scraps and other loose pieces of material out of the duct system. Allow for a means of removal of such material.
- C. Check the duct system to ensure that there are no air leaks through joints.

### 3.04 SAFETY PRECAUTIONS

- A. Contractor's employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation materials and shall include (but not be limited to) disposable dust respirators, gloves, hard hats and eye protection.
- B. The contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.

END OF SECTION 230714



## SECTION 230719 - PIPING INSULATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes insulating the following HVAC piping systems:
  - 1. Heating hot-water piping.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

## 1.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

## 1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

## PART 2 - PRODUCTS

### 2.1 INSULATION MATERIALS

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
  - 1. Prefabricated Fitting Covers: Comply with ASTM C 450 and ASTM C 585 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.
- C. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  - 1. Block Insulation: ASTM C 552, Type I.
  - 2. Special-Shaped Insulation: ASTM C 552, Type III.
  - 3. Board Insulation: ASTM C 552, Type IV.
  - 4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
  - 5. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
  - 6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

- D. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, with factory-applied FSK jacket/FSP jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- E. Mineral-Fiber, Preformed Pipe Insulation:
  - 1. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- F. Mineral-Fiber, Pipe Insulation Wicking System: Preformed pipe insulation complying with ASTM C 547, Type I, Grade A, with absorbent cloth factory-applied to the entire inside surface of preformed pipe insulation and extended through the longitudinal joint to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth.
- G. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ/FSK jacket complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. (40 kg/cu. m) or more. Thermal conductivity (k-value) at 100 deg F (55 deg C) is 0.29 Btu x in./h x sq. ft. x deg F (0.042 W/m x K) or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

## 2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F (minus 73 to plus 93 deg C).
  - 1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Adhesive 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."
- C. Phenolic and Polyisocyanurate Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F (minus 59 to plus 149 deg C).
  - 1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Adhesive 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."
- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Adhesive 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. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. PVC Jacket Adhesive: Compatible with PVC jacket.
1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Adhesive 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."

## 2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
  2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
  3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
  4. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.03 metric perm) at 35-mil (0.9-mm) dry film thickness.
  2. Service Temperature Range: 0 to 180 deg F (Minus 18 to plus 82 deg C).
  3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
  4. Color: White.
- D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms (1.2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
  2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
  3. Solids Content: 60 percent by volume and 66 percent by weight.
  4. Color: White.

## 2.4 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
  3. Service Temperature Range: 0 to plus 180 deg F (Minus 18 to plus 82 deg C).
  4. Color: White.

## 2.5 SEALANTS

- A. Joint Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
  2. Permanently flexible, elastomeric sealant.
  3. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
  4. Color: White or gray.
  5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  6. Sealants 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."
- B. FSK and Metal Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
  2. Fire- and water-resistant, flexible, elastomeric sealant.
  3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
  4. Color: Aluminum.
  5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  6. Sealants 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."
- C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
  2. Fire- and water-resistant, flexible, elastomeric sealant.
  3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
  4. Color: White.
  5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  6. Sealants 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."

## 2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
  2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
  3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
  4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
  5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms (0.86 metric perms) when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

## 2.7 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
1. Adhesive: As recommended by jacket material manufacturer.
  2. Color: Color-code jackets based on system.
  3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
    - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- D. Metal Jacket:
1. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.
    - a. Moisture Barrier for Indoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper/2.5-mil- (0.063-mm-) thick polysurlyn.
    - b. Factory-Fabricated Fitting Covers:
      - 1) Same material, finish, and thickness as jacket.
      - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
      - 3) Tee covers.
      - 4) Flange and union covers.
      - 5) End caps.
      - 6) Beveled collars.
      - 7) Valve covers.
      - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

## 2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
  - 1. Width: 3 inches (75 mm).
  - 2. Thickness: 11.5 mils (0.29 mm).
  - 3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
  - 4. Elongation: 2 percent.
  - 5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
  - 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
  
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
  - 1. Width: 3 inches (75 mm).
  - 2. Thickness: 6.5 mils (0.16 mm).
  - 3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
  - 4. Elongation: 2 percent.
  - 5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
  - 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
  
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
  - 1. Width: 2 inches (50 mm).
  - 2. Thickness: 6 mils (0.15 mm).
  - 3. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
  - 4. Elongation: 500 percent.
  - 5. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.
  
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
  - 1. Width: 2 inches (50 mm).
  - 2. Thickness: 3.7 mils (0.093 mm).
  - 3. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
  - 4. Elongation: 5 percent.
  - 5. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

## 2.9 SECUREMENTS

- A. Bands:
  - 1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015 inch (0.38 mm) thick, 1/2 inch (13 mm) wide with [wing seal] [or] [closed seal].
  - 2. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) wide.
  
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.
  
- C. Wire: 0.080-inch (2.0-mm) nickel-copper alloy soft-annealed, galvanized steel.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
  - 1. Verify that systems to be insulated have been tested and are free of defects.
  - 2. Verify that surfaces to be insulated are clean and dry.
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
  - 1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F (0 and 149 deg C) with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
  - 1. Draw jacket tight and smooth.
  - 2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
  - 3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.
    - a. For below-ambient services, apply vapor-barrier mastic over staples.
  - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
  - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
  - 1. Vibration-control devices.
  - 2. Testing agency labels and stamps.
  - 3. Nameplates and data plates.
  - 4. Manholes.
  - 5. Handholes.
  - 6. Cleanouts.

### 3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
  - 1. Comply with requirements in **Section 078413 "Penetration Firestopping"** for firestopping.
- C. Insulation Installation at Floor Penetrations:
  - 1. Pipe: Install insulation continuously through floor penetrations.
  - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in **Section 078413 "Penetration Firestopping."**

### 3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
  - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
  - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
  - 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
  - 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for

- above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
  9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
  2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
  3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
  4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
  5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### 3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
  2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
  3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches (150 mm) o.c.
  4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

### 3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

### 3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

### 3.9 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

### 3.10 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  1. Fire-suppression piping.
  2. Drainage piping located in crawl spaces.
  3. Below-grade piping.
  4. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

### 3.11 INDOOR PIPING INSULATION SCHEDULE

- A. Heating-Hot-Water Supply and Return, 200 Deg. F and below:
  1. NPS 1-1/4 and Smaller: Insulation shall be the following:
    - a. Mineral Fiber, Preformed Pipe, Type I: 1-1/2 inches thick.
  2. NPS 1-1/2 and Larger: Insulation shall be the following:
    - a. Mineral Fiber, Preformed Pipe, Type I: 2 inches thick.

### 3.12 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Exposed:
  1. Aluminum, Smooth: 0.016 inch thick.

END OF SECTION 230719

## SECTION 23 09 93 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes control sequences for HVAC systems, subsystems, & equipment.

#### 1.2 RELATED DOCUMENTS

- A. Drawings & general provisions of the Contract, including General and Supplementary Conditions & Division 01 Specification Sections, apply to this Section.

#### 1.3 HEAT PUMP VRF AC UNITS

- A. In cooling / heating automatic changeover operation, the unit is controlled as shown below based on set differential value. Factory setting of differential valve is 9°F (5°C).  
Default Cooling/Heating  
Differential: 9°F  
Combination of Cooling and Heating mode operation  
Changeover is determined by the set point in the current mode and the Differential  
The Differential that can be set is 0°F (0 C) to 12.6°F (7°C) with 1.8°F (1°C) basis, and it is configured by the indoor unit field setting with 0°F as the default.

1. In the Auto mode, the VRV indoor unit changes over its operation mode from cooling mode to heating mode when a room temperature goes down with a differential of 2 + 36°F (2°C) below the cooling set point.
2. At that time, the heating set point is set at the cooling set point less the Differential.
3. It changes from to the heating mode to the cooling mode when the room temperature is 5.4°F (3°C) above the set point temperature.

In cooling mode, the thermostat on/off sensor is working from the +/-0.9°F (0.5°C) cooling set point. If the room temperature falls 3.6°F (2°C) below the cooling set point, it goes into heating mode with a heating set point that equals the cooling set point less the differential of 0°F. Thermo-on mode occurs (rather than thermo-off) because the room temperature is below heating set point minus 1°F at the changeover point.

In heating mode, thermo-off/on is working with +/-1°F basis around a heating set point. When a room temperature rises by 5.4°F (3°C) above the heating set point, it goes into the cooling mode with the cooling set point that is the heating set point plus the differential of 0°F (0°C). Cooling thermo-on mode, rather than thermo-off, is triggered because the room temperature is above the cooling set point plus 1°F at the changeover point.

#### 1.4 FINTUBE, RADIATORS AND CONVECTORS

- A. "Unoccupied": The Heating Control valve (FTR) shall be commanded "closed".
- B. "Unoccupied Heating": When the Space Temperature (RMT) < the "Unoccupied Heating" Setpoint (UHSP) the Heating Control valve (FTR) shall be commanded "open". When the

Space Temperature (RMT) > the “Unoccupied Heating” Setpoint (UHSP) hysteresis, the Heating Control valve (FTR) shall be commanded “closed”.

- C. “Occupied”: When the Space Temperature (RMT) < the “Occupied Heating” Setpoint (HSP) the Heating Control valve (FTR) shall be commanded “open”. When the Space Temperature (RMT) > the “Occupied Heating” Setpoint (HSP) hysteresis, the Heating Control valve (FTR) shall be commanded “closed”.

#### 1.5 CABINET/UNIT HEATER– HOT WATER VALVE

- A. Control: Provide, install, and wire an electric Thermostat (TC) with setpoint (adj.); an Hot Water pipe aquastat (AQS); provide and wire a Normally Open - 2 position Hot Water Control valve (HWV). The Space Heating Setpoint (LHSP) is initially set at 70°F (adj.); the Aquastat switch (AQS) shall be set at 95°F (adj.). When the temperature is less than the Thermostat (TC) Heating Setpoint (LHSP), the Hot Water Control valve (HWV) shall “open”. When the pipe temperature is more than the Aquastat (AQS) setpoint, the Cabinet/Unit Heater’s fan shall start. When the temperature is more than the Thermostat (TC) Heating Setpoint (LHSP) hysteresis, the Cabinet/Unit heater’s Fan shall stop, the Hot Water Control valve (HWV) shall “close”.
- A. “Unoccupied”: The Heating Control valve (CH) shall be commanded “closed” and supply fan “OFF”
- B. “Occupied”: When heating valve (CH) is commanded “ON”, the (CH) fan shall be “ON”.

#### FAND COIL UNIT (FCU)– HOT WATER VALVE AND MOTORIZED DAMPER

- C. Control: Provide, install, and wire an electric Thermostat (TC) with setpoint (adj.); an Hot Water pipe aquastat (AQS); provide and wire a Normally Open - 2 position Hot Water Control valve (HWV). The Space Heating Setpoint (LHSP) is initially set at 70°F (adj.); the Aquastat switch (AQS) shall be set at 95°F (adj.). When the temperature is less than the Thermostat (TC) Heating Setpoint (LHSP), the Hot Water Control valve (HWV) shall “open”. When the pipe temperature is more than the Aquastat (AQS) setpoint, the Cabinet/Unit Heater’s fan shall start. When the temperature is more than the Thermostat (TC) Heating Setpoint (LHSP) hysteresis, the Cabinet/Unit heater’s Fan shall stop, the Hot Water Control valve (HWV) shall “close”. (FCU, AQS) shall be interlock with their respective hot water circulating pumps.
- D. “Unoccupied”: The Heating Control valve (FCU) shall be commanded “closed”. And outside air motorized damper shall remain “CLOSE”.
- E. “Occupied”: When heating valve (FCU) is commanded “ON”, the outside air damper shall be commanded to be in the “OPEN” position.

#### 1.6 EXHAUST FAN

- A. “Unoccupied” mode of operations: The exhaust fan shall be interlocked with their respective FCU. When FCU is OFF the exhaust fans shall be OFF.
- B. “Occupied” mode: The exhaust fan shall be interlocked with their respective FCU. When FCU is ON in occupied mode the exhaust fans shall be commanded ON.

1.7 COMMISSIONING

- A. Startup: The contractor shall be set up & checked by factory trained competent technicians skilled in the setting & adjustment of the equipment used in this project. The technicians are to be experienced in the type of HVAC systems associated with this project.
- B. Demonstration: At the completion of the commissioning, the contractor shall: demonstrate the sequence of operations for each system to the Architect or representative.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230993



## SECTION 232113 - HYDRONIC PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:
  - 1. Above ground hot-water heating piping.
  - 2. Air-vent piping.
  - 3. Safety-valve-inlet and -outlet piping.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:
  - 1. Hot-Water Heating Piping: 175 psig at 250 deg F.
  - 2. Air-Vent Piping: 200 deg F.
  - 3. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of the following:
  - 1. All types of piping.
- B. Shop Drawings: Detail, at 1/4 scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.
- C. Welding certificates.
- D. Qualification Data: For Installer.
- E. Field quality-control test reports.

- F. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.
- G. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. Installers of Pressure-Sealed Joints: Installers shall be certified by the pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.
- B. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
  - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
  - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

## 1.6 EXTRA MATERIALS

- A. Water-Treatment Chemicals: Furnish enough chemicals for initial system startup and for preventive maintenance for one year from date of Substantial Completion.
- B. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

## PART 2 - PRODUCTS

### 2.1 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tubing: ASTM B 88, Type L (ASTM B 88M, Type B).
- B. Annealed-Temper Copper Tubing: ASTM B 88, Type K (ASTM B 88M, Type A).
- C. DWV Copper Tubing: ASTM B 306, Type DWV.
- D. Wrought-Copper Fittings: ASME B16.22.

1. 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:
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- E. Wrought-Copper Unions: ASME B16.22.

## 2.2 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.
- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 250 as indicated in Part 3 "Piping Applications" Article.
- C. Malleable-Iron Threaded Fittings: ASME B16.3, Class 300 as indicated in Part 3 "Piping Applications" Article.
- D. Malleable-Iron Unions: ASME B16.39; Class 250 or 300 as indicated in Part 3 "Piping Applications" Article.
- E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Class 250; raised ground face, and bolt holes spot faced as indicated in Part 3 "Piping Applications" Article.
- F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
  1. Material Group: 1.1.
  2. End Connections: Butt welding.
  3. Facings: Raised face.
- H. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

## 2.3 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.
    - a. Full-Face Type: For flat-face, Class 250, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.
- E. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

## 2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions:
  - 1. 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:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Capitol Manufacturing Company.
    - b. Central Plastics Company.
    - c. Hart Industries International, Inc.
    - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    - e. Zurn Plumbing Products Group; AquaSpec Commercial Products Division.
    - f. Or Approved Equal.
  - 3. Factory-fabricated union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).
- D. Dielectric Flanges:
  - 1. 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:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Capitol Manufacturing Company.
    - b. Central Plastics Company.
    - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    - d. Or Approved Equal.
  - 3. Factory-fabricated companion-flange assembly, for 300-psig minimum working pressure as required to suit system pressures.
- E. Dielectric-Flange Kits:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Advance Products & Systems, Inc.
  - b. Calpico, Inc.
  - c. Central Plastics Company.
  - d. Pipeline Seal and Insulator, Inc.
  - e. Or Approved Equal.
3. Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
4. Separate companion flanges and steel bolts and nuts shall have 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Calpico, Inc.
  - b. Lochinvar Corporation.
  - c. Or Approved Equal.
3. Galvanized-steel coupling with inert and noncorrosive thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

G. Dielectric Nipples:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Perfection Corporation; a subsidiary of American Meter Company.
  - b. Sioux Chief Manufacturing Company, Inc.
  - c. Or Approved Equal.
3. Electroplated steel or ductile iron nipple with inert and noncorrosive, thermoplastic lining; plain, or threaded; and 300-psig (2070-kPa) minimum working pressure at 230 deg F (110 deg C). Victaulic Style 47.

## 2.5 VALVES

- A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 23 Section "23 05 23 General-duty Valves for HVAC Piping."
- B. Automatic Temperature-Control Valves, Actuators, and Sensors.
- C. Ametal® Brass Calibrated-Orifice, Balancing Valves:
  - 1. 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:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 3. Basis-of-Design Product: Subject to compliance with requirements, provide a product by one of the following:
    - a. Armstrong Pumps, Inc.
    - b. Victaulic/Tour & Andersson Series 786, 787 or 78K.
    - c. Or Approved Equal.
  - 4. Body: Ametal® brass copper alloy, y-pattern, globe type.
  - 5. Seat: Ametal® brass copper alloy.
  - 6. End Connections: Threaded or soldered.
  - 7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
  - 8. Handle Style: Multiple-turn digital readout handwheel with memory stop to retain set position.
  - 9. CWP Rating: Minimum 200 psig (860 kPa).
  - 10. Maximum Operating Temperature: 250 deg F (121 deg C).
  - 11. Coil Components: Install Series 78U union port fitting and Series 78Y strainer/ball valve combination to complete terminal hookup at coil outlet.
  - 12. Differential Pressure Controller: Install Series 793 differential pressure controller to stabilize differential pressure and ensure stable and accurate modulating control. Ametal® brass copper alloy body, bonnet, cone and spindles, threaded ends only.
- D. Ductile-Iron, Calibrated-Orifice, Balancing Valves:
  - 1. 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:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 3. Basis-of-Design Product: Subject to compliance with requirements, provide a product by one of the following:
    - a. Armstrong Pumps, Inc.
    - b. Victaulic/Tour & Andersson Series 788 and 789
    - c. Or Approved Equal.
  - 4. Body: Ductile iron body, globe pattern.
  - 5. Stem Seals: EPDM O-rings.
  - 6. Seat: Ductile iron.
  - 7. End Connections: Flanged.
  - 8. Pressure Gage Connections: Integral seals for portable differential pressure meter.

9. Handle Style: Multiple-turn digital readout handwheel with memory stop to retain set position.
10. CWP Rating: Minimum 200 psig (860 kPa).
11. Maximum Operating Temperature: 250 deg F (121 deg C).
12. Differential Pressure Controller: Install Series 794 differential pressure controller with 2-1/2" through 4" valves to stabilize differential pressure and ensure stable and accurate modulating control. Ductile iron body, Ametal® brass copper alloy bonnet, cone and spindles, flanged ends only.

E. Diaphragm-Operated, Pressure-Reducing Valves:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide a product by one of the following:
  - a. Amtrol, Inc.
  - b. Armstrong Pumps, Inc.
  - c. Bell & Gossett Domestic Pump; a division of ITT Industries.
  - d. Conbraco Industries, Inc.
  - e. Spence Engineering Company, Inc.
  - f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
  - g. Or Approved Equal.
4. Body: Bronze or brass.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: Brass.
7. Stem Seals: EPDM O-rings.
8. Diaphragm: EPT.
9. Low inlet-pressure check valve.
10. Inlet Strainer: Removable without system shutdown.
11. Valve Seat and Stem: Noncorrosive.
12. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

F. Diaphragm-Operated Safety Valves:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide a product by one of the following:
  - a. Amtrol, Inc.
  - b. Armstrong Pumps, Inc.
  - c. Bell & Gossett Domestic Pump; a division of ITT Industries.
  - d. Conbraco Industries, Inc.
  - e. Spence Engineering Company, Inc.
  - f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

- g. Or Approved Equal.
- 4. Body: Bronze or brass.
- 5. Disc: Glass and carbon-filled PTFE.
- 6. Seat: Brass.
- 7. Stem Seals: EPDM O-rings.
- 8. Diaphragm: EPT.
- 9. Wetted, Internal Work Parts: Brass and rubber.
- 10. Inlet Strainer: Removable without system shutdown.
- 11. Valve Seat and Stem: Noncorrosive.
- 12. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

G. Automatic Flow-Control Valves:

- 1. 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:
- 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 3. Basis-of-Design Product: Subject to compliance with requirements, provide a product by one of the following:
  - a. Flow Design Inc.
  - b. Griswold Controls.
  - c. Or Approved Equal.
- 4. Body: Brass or ferrous metal.
- 5. Piston and Spring Assembly: Stainless steel, tamper proof, self cleaning, and removable.
- 6. Combination Assemblies: Include bronze or brass-alloy ball valve.
- 7. Identification Tag: Marked with zone identification, valve number, and flow rate.
- 8. Size: Same as pipe in which installed.
- 9. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
- 10. Minimum CWP Rating: 175 psig.
- 11. Maximum Operating Temperature: 200 deg F (93 deg C).

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-water heating piping, aboveground, NPS 3 (DN 75) and smaller, shall be the following:
  - 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or brazed joints.
- B. Hot-water heating piping, aboveground, NPS 4 (DN 100) and larger, shall be the following:
  - 1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.

- C. Air-Vent Piping:
  - 1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.
  - 2. Outlet: Type K (A), annealed-temper copper tubing with soldered or flared joints.
  
- D. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.

### 3.2 VALVE APPLICATIONS

- A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.
- B. Install balancing valves at each branch connection to return main.
- C. Install globe type balancing valves in the return pipe of each heating or cooling terminal.
- D. Install check valves at each pump discharge and elsewhere as required to control flow direction.
- E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; and pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

### 3.3 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.

- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install drains, consisting of a tee fitting, NPS 3/4 (DN 20) ball valve, and short NPS 3/4 (DN 20) threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Install branch connections to mains using [mechanically formed] tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- P. Install valves according to Division 230523 Section "Valves."
- Q. Install unions in piping, NPS 2 (DN 50) and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- R. Install flanges in piping, NPS 2-1/2 (DN 65) and larger, at final connections of equipment and elsewhere as indicated.
- S. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 (DN 20) nipple and ball valve in blowdown connection of strainers NPS 2 (DN 50) and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2 (DN 50).
- T. Identify piping as specified in Division 23 Section "Mechanical Identification."

### 3.4 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports." Comply with the following requirements for maximum spacing of supports.
- B. Seismic restraints are specified in Division 23 Section "Mechanical Vibration and Seismic Controls."
- C. Install the following pipe attachments:
  - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet (6 m) long.
  - 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet (6 m) or longer.
  - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze.
  - 4. Spring hangers to support vertical runs.

5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
1. NPS 3/4 (DN 20): Maximum span, 7 feet (2.1 m); minimum rod size, 1/4 inch (6.4 mm).
  2. NPS 1 (DN 25): Maximum span, 7 feet (2.1 m); minimum rod size, 1/4 inch (6.4 mm).
  3. NPS 1-1/2 (DN 40): Maximum span, 9 feet (2.7 m); minimum rod size, 3/8 inch (10 mm).
  4. NPS 2 (DN 50): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (10 mm).
  5. NPS 2-1/2 (DN 65): Maximum span, 11 feet (3.4 m); minimum rod size, 3/8 inch (10 mm).
  6. NPS 3 (DN 80): Maximum span, 12 feet (3.7 m); minimum rod size, 3/8 inch (10 mm).
  7. NPS 4 (DN 100): Maximum span, 14 feet (4.3 m); minimum rod size, 1/2 inch (13 mm).
  8. NPS 6 (DN 150): Maximum span, 17 feet (5.2 m); minimum rod size, 1/2 inch (13 mm).
- E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
1. NPS 3/4 (DN 20): Maximum span, 5 feet (1.5 m); minimum rod size, 1/4 inch (6.4 mm).
  2. NPS 1 (DN 25): Maximum span, 6 feet (1.8 m); minimum rod size, 1/4 inch (6.4 mm).
  3. NPS 1-1/2 (DN 40): Maximum span, 8 feet (2.4 m); minimum rod size, 3/8 inch (10 mm).
  4. NPS 2 (DN 50): Maximum span, 8 feet (2.4 m); minimum rod size, 3/8 inch (10 mm).
  5. NPS 2-1/2 (DN 65): Maximum span, 9 feet (2.7 m); minimum rod size, 3/8 inch (10 mm).
  6. NPS 3 (DN 80): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (10 mm).
- F. Support vertical runs at roof, at each floor, and at 10-foot (3-m) intervals between floors.

### 3.5 PIPE JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

- G. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

### 3.6 TERMINAL EQUIPMENT CONNECTIONS

- A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.
- B. Install control valves in accessible locations close to connected equipment.
- C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.
- D. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Division 23 Section "Meters and Gages."

### 3.7 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
  - 1. Leave joints, including welds, uninsulated and exposed for examination during test.
  - 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
  - 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
  - 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
  - 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
  - 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
  - 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
  - 3. Isolate expansion tanks and determine that hydronic system is full of water.
  - 4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
  - 5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.

6. Prepare written report of testing.
- C. Perform the following before operating the system:
1. Open manual valves fully.
  2. Inspect pumps for proper rotation.
  3. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
  4. Set temperature controls so all coils are calling for full flow.
  5. Inspect and set operating temperatures of hydronic equipment, such as boilers, to specified values.
  6. Verify lubrication of motors and bearings.

END OF SECTION 232113



## SECTION 232116 - HYDRONIC PIPING SPECIALTIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes special-duty valves and specialties for the following:
  - 1. Above ground hot-water heating piping.
  - 2. Air-vent piping.
  - 3. Safety-valve-inlet and -outlet piping.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
  - 1. Valves: Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
  - 2. Air-control devices.
  - 3. Hydronic specialties.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air-control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

#### 1.6 QUALITY ASSURANCE

- A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
  - 1. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
1. Hot-Water Heating Piping: 175 psig at 250 deg F.
  2. Air-Vent Piping: 200 deg F.
  3. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

### 2.2 VALVES

- A. Gate, Globe, Check and Ball Valves: Comply with requirements specified in Section 230523 "General-Duty Valves for HVAC Piping."
- B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Division 23 Sections.
- C. General: Provide factory-fabricated hydronic specialties recommended by manufacturer for use in service indicated. Provide hydronic specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Owner's Representative to comply with installation requirements. Provide sizes and connections which properly mate with pipe, tube and equipment connections.
- D. Balancing Valves:
1. Where the Drawings indicate a balancing valve in the water piping, provide a 150 psig diaphragm packless type combination shut-off and balancing valve with the diaphragm attached to the valve stem. Valve shall be complete with a locking mechanism that can be set at a balance point, so that the valve may be opened and closed, but not opened beyond the pre-set balance point. Valve shall be furnished with an indicator, marked to show 0% to 100% of flow. Valve body shall be of cast iron or semi-steel and shall be painted with a rust-preventive epoxy or equal coating.
  2. Manufacturers: Subject to compliance with requirements, manufacturers offering balancing valves which may be incorporated in the work include, but are not limited to, the following:
    - a. American Air Filter Co.
    - b. Bell & Gossett ITT; Fluid Handling Div.
    - c. Danfoss, Inc.
    - d. Griswold Controls
    - e. Milwaukee Valve Co., Inc.
    - f. Spirax Sarco.
    - g. Taco, Inc.
    - h. Or Approved Equal.
- E. Balancing Cocks:

1. Provide balance cocks as shown on the Drawings, of one of the following types:
  - a. Threaded Ends 2" and Smaller" Class 250, bronze body, bronze plug, screwdriver operated, straight or angle pattern.
  - b. Soldered Ends 2" or Smaller: Class 250, bronze body, bronze plug, screwdriver operated, straight or angled pattern.
2. Manufacturers: Subject to compliance with requirements, manufacturers offering balance cocks which may be incorporated in the work include, but are not limited to the following:
  - a. American Air Filter Co.
  - b. Bell & Gossett ITT; Fluid Handling Div.
  - c. Danfoss, Inc.
  - d. Griswold Controls
  - e. Milwaukee Valve Co., Inc.
  - f. Spirax Sarco.
  - g. Taco, Inc.
  - h. Or Approved Equal.

F. Flow Control Valves:

1. Provide flow control valves pressure rated for 250 psi, containing lift check assembly which will automatically open by means of pump flow pressure, and automatically close when pump is not operating. Pressure with means to manually open in case of pump failure.
  - a. Threaded Ends 2-1/2" and Smaller: Cast-iron body, bronze check mechanism, screw-in bonnet, straight or angle pattern.
  - b. Soldered Ends 4" and Smaller: Cast-bronze body, bronze check mechanism, screw-in bonnet, straight or angle pattern.
  - c. Flanged Ends 2-1/2" and Larger: Cast-iron body, bronze check mechanism, screw-in bonnet, straight or angle pattern.
2. Manufacturers: Subject to compliance with requirements, manufacturers offering flow control valves which may be incorporated in the work include, but are not limited to, the following:
  - a. Armstrong Pumps, Inc.
  - b. Bell & Gossett ITT; Fluid Handling Div.
  - c. Dunham-Bush, Inc.
  - d. Taco, Inc.
  - e. Or Approved Equal.

G. Water Relief Valves:

1. Provide water relief valves as indicated on the Drawings, of size and capacity for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.
  - a. Iron body with non-ferrous internal parts, ASME rated, gradually relieving not "pop" type.

2. Manufacturers: Subject to compliance with requirements, manufacturers offering water relief valves which may be incorporated in the work include, but are not limited to, the following:
  - a. Amtrol, Inc.
  - b. Bell & Gossett ITT; Fluid Handling Div.
  - c. Spirax Sarco.
  - d. Watts Regulator Co.
  - e. Or Approved Equal.

H. Pressure Reducing Valves:

1. Where shown on the Drawings, provide in the make-up water supply line, an iron body pressure reducing valve with brass internal parts. Reducing valve shall be provided with a strainer and a check valve to prevent back flow of water when city water pressure is less than the system pressure. Valve setting shall be as indicated on the Drawings.
2. Manufacturers: Subject to compliance with requirements, manufacturers offering reducing valves which may be incorporated in the work include, but are not limited to, the following:
  - a. Amtrol, Inc.
  - b. Armstrong Pumps, Inc.
  - c. Bell & Gossett ITT; Fluid Handling Div.
  - d. Taco, Inc.
  - e. Or Approved Equal.

2.3 AIR-CONTROL DEVICES

A. Manual Air Vents:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering reducing valves which may be incorporated in the work include, but are not limited to, the following:
  - a. Amtrol, Inc.
  - b. Armstrong Pumps, Inc.
  - c. Bell & Gossett ITT; Fluid Handling Div.
  - d. Taco, Inc.
  - e. Or Approved Equal.
2. Body: Bronze.
3. Internal Parts: Nonferrous.
4. Operator: Screwdriver or thumbscrew.
5. Inlet Connection: NPS 1/2 (DN 15).
6. Discharge Connection: NPS 1/8 (DN 6).
7. CWP Rating: 150 psig (1035 kPa).
8. Maximum Operating Temperature: 225 deg F (107 deg C).

B. Automatic Air Vents:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering reducing valves which may be incorporated in the work include, but are not limited to, the following:
  - a. Amtrol, Inc.
  - b. Armstrong Pumps, Inc.
  - c. Bell & Gossett ITT; Fluid Handling Div.
  - d. Taco, Inc.
  - e. Or Approved Equal.
2. Body: Bronze or cast iron.
3. Internal Parts: Nonferrous.
4. Operator: Noncorrosive metal float.
5. Inlet Connection: NPS 1/2 (DN 15).
6. Discharge Connection: NPS 1/4 (DN 8).
7. CWP Rating: 150 psig (1035 kPa).
8. Maximum Operating Temperature: 240 deg F (116 deg C).

C. Expansion Tanks:

1. Furnish and install as shown on the drawings, bladder type expansion tanks. Tanks shall be air pre-charged to the initial fill pressure of the system. It shall be suitable for a maximum working pressure of 250 psi. Anchor tank to prevent lateral or seismic movement.
2. Tanks shall be furnished with ASME stamp and certification papers.
3. Tanks shall have a sealed in elastomer diaphragm suitable for an operating temperature of 240°F.
4. Provide full line size lock-shield gate valve. Lock in open position.

D. Tangential-Type Air Separators:

1. Furnish and install external air separation devices consisting of air separator with strainer, 250 psi working pressure, and float vent.
2. A blow-down connection shall be provided to facilitate routine cleaning of the unit.
3. The air separator shall be Taco, Armstrong, Bell & Gossett, or Sarco. In-Line Air Separators:

## 2.4 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: Stainless-steel, 60-mesh strainer, or perforated stainless-steel basket.
4. CWP Rating: 250 psig.

B. Basket Strainers:

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 250 psig.

C. T-Pattern Strainers:

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.
4. CWP Rating: 750 psig (5170 kPa).

D. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch (20-mm) misalignment.
4. CWP Rating: 150 psig (1035 kPa).
5. Maximum Operating Temperature: 250 deg F (121 deg C).

E. Spherical, Rubber, Flexible Connectors:

1. Body: Fiber-reinforced rubber body.
2. End Connections: Steel flanges drilled to align with Class 300 steel flanges.
3. Performance: Capable of misalignment.
4. CWP Rating: 150 psig (1035 kPa).  
Maximum Operating Temperature: 250 deg F (121 deg C).

## PART 3 - EXECUTION

### 3.1 VALVE APPLICATIONS

- A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.
- B. Install check valves at each pump discharge and elsewhere as required to control flow direction.
- C. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

### 3.2 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.
- B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Install manual vents at heat-transfer coils and elsewhere as required for air venting.

END OF SECTION 232116



## SECTION 232300 - REFRIGERANT PIPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes refrigerant piping used for air conditioning applications.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
  - 1. Suction Lines for Air Conditioning Applications: 300 psig.
  - 2. Suction Lines for Heat Pump Applications: 535 psig.
  - 3. Hot Gas and Liquid Lines: 535 psig.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:
  - 1. Thermostatic expansion valves.
  - 2. Solenoid valves.
  - 3. Hot gas bypass valves.
  - 4. Filter dryers.
  - 5. Strainers.
  - 6. Pressure-regulating valves.
- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
  - 1. Shop Drawing Scale: 1/4 inch equals 1 foot.
  - 2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between

compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

- C. Welding certificates.
- D. Field quality control test reports.
- E. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

#### 1.6 PRODUCT STORAGE AND HANDLING

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

### PART 2 - PRODUCTS

#### 2.1 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 280, Type ACR.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8.

#### 2.2 VALVES AND SPECIALTIES

- A. Diaphragm Packless Valves:
  - 1. Body and Bonnet: Forged brass or cast bronze; globe design with straight through or angle pattern.
  - 2. Diaphragm: Phosphor bronze and stainless steel with stainless steel spring.
  - 3. Operator: Rising stem and hand wheel.
  - 4. Seat: Nylon.
  - 5. End Connections: Socket, union, or flanged.

6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

B. Packed Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

- E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.
  - 1. Body and Bonnet: Plated steel.
  - 2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
  - 3. Seat: Polytetrafluoroethylene.
  - 4. End Connections: Threaded.
  - 5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
  - 6. Working Pressure Rating: 400 psig.
  - 7. Maximum Operating Temperature: 240 deg F.
  - 8. Manual operator.
  
- F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
  - 1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
  - 2. Piston, Closing Spring, and Seat Insert: Stainless steel.
  - 3. Seat Disc: Polytetrafluoroethylene.
  - 4. End Connections: Threaded.
  - 5. Working Pressure Rating: 400 psig.
  - 6. Maximum Operating Temperature: 240 deg F.
  
- G. Thermostatic Expansion Valves: Comply with ARI 750.
  - 1. Body, Bonnet, and Seal Cap: Forged brass or steel.
  - 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
  - 3. Packing and Gaskets: Non-asbestos.
  - 4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
  - 5. Suction Temperature: 40 deg F.
  - 6. Superheat: Adjustable.
  - 7. Reverse-flow option (for heat pump applications).
  - 8. End Connections: Socket, flare, or threaded union.
  - 9. Working Pressure Rating: 700 psig.

- H. Hot Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.
  - 1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
  - 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
  - 3. Packing and Gaskets: Non-asbestos.
  - 4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
  - 5. Seat: Polytetrafluoroethylene.
  - 6. Equalizer: Internal.
  - 7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
  - 8. End Connections: Socket.
  - 9. Throttling Range: Maximum 5 psig.
  - 10. Working Pressure Rating: 500 psig.
  - 11. Maximum Operating Temperature: 240 deg F.
  
- I. Straight-Type Strainers:
  - 1. Body: Welded steel with corrosion-resistant coating.
  - 2. Screen: 100-mesh stainless steel.
  - 3. End Connections: Socket or flare.
  - 4. Working Pressure Rating: 500 psig.
  - 5. Maximum Operating Temperature: 275 deg F.
  
- J. Angle-Type Strainers:
  - 1. Body: Forged brass or cast bronze.
  - 2. Drain Plug: Brass hex plug.
  - 3. Screen: 100-mesh monel.
  - 4. End Connections: Socket or flare.
  - 5. Working Pressure Rating: 500 psig.
  - 6. Maximum Operating Temperature: 275 deg F.
  
- K. Moisture/Liquid Indicators:

1. Body: Forged brass.
  2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
  3. Indicator: Color coded to show moisture content in ppm.
  4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
  5. End Connections: Socket or flare.
  6. Working Pressure Rating: 500 psig.
  7. Maximum Operating Temperature: 240 deg F.
- L. Replaceable-Core Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted steel shell with ductile iron cover, stainless steel screws, and neoprene gaskets.
  2. Filter Media: 10 micron, pleated with integral end rings; stainless steel support.
  3. Desiccant Media: Activated alumina.
  4. Designed for reverse flow (for heat pump applications).
  5. End Connections: Socket.
  6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
  7. Maximum Pressure Loss: 2 psig.
  8. Working Pressure Rating: 500 psig.
  9. Maximum Operating Temperature: 240 deg F.
- M. Permanent Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted steel shell.
  2. Filter Media: 10 micron, pleated with integral end rings; stainless steel support.
  3. Desiccant Media: Activated alumina.
  4. Designed for reverse flow (for heat pump applications).
  5. End Connections: Socket.
  6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
  7. Maximum Pressure Loss: 2 psig.

8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 240 deg F.

N. Mufflers:

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or flare.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

O. Receivers: Comply with ARI 495.

1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
2. Comply with UL 207; listed and labeled by an NRTL.
3. Body: Welded steel with corrosion-resistant coating.
4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
5. End Connections: Socket or threaded.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

P. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

## 2.3 REFRIGERANTS

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. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

- B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Suction Lines NPS 3-1/2 and Smaller for Conventional Air Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- B. Hot Gas and Liquid Lines and Suction Lines for Heat Pump Applications: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- C. Safety Relief Valve Discharge Piping: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

### 3.2 VALVE AND SPECIALTY APPLICATIONS

- A. Install packed-angle valves in suction and discharge lines of compressor.
- B. Install service valves for gage taps at inlet and outlet of hot gas bypass valves and strainers if they are not an integral part of valves and strainers.
- C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.
- D. Except as otherwise indicated, install packed-angle valves on inlet and outlet side of filter dryers.
- E. Install a full-sized, three-valve bypass around filter dryers.
- F. Install solenoid valves upstream from each expansion valve and hot gas bypass valve. Install solenoid valves in horizontal lines with coil at top.
- G. Install thermostatic expansion valves as close as possible to distributors on evaporators.
  - 1. Install valve so diaphragm case is warmer than bulb.
  - 2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
  - 3. If external equalizer lines are required, make connection where it will reflect suction line pressure at bulb location.
- H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety relief valve discharge line to outside according to ASHRAE 15.
- I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:
  - 1. Solenoid valves.

2. Thermostatic expansion valves.
  3. Hot gas bypass valves.
  4. Compressor.
- K. Install filter dryers in liquid line between compressor and thermostatic expansion valve and in the suction line at the compressor.
- L. Install receivers sized to accommodate pump-down charge.

### 3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping adjacent to machines to allow service and maintenance.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- J. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section, "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- K. Slope refrigerant piping as follows:
1. Install horizontal hot gas discharge piping with a uniform slope downward away from compressor.
  2. Install horizontal suction lines with a uniform slope downward to compressor.
  3. Install traps and double risers to entrain oil in vertical runs.

4. Liquid lines may be installed level.

- L. When brazing or soldering, remove solenoid valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion valve bulb.
- M. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- N. Install escutcheons for piping penetrations of walls, ceilings, and floors.

### 3.4 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
  - 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
  - 2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.
- F. Welded Joints: Construct joints according to AWS D10.12/D10.12M.
- G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

### 3.5 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Division 23 Section, "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
  - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
  - 2. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
  - 1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
  - 2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.

3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.

### 3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
  1. Comply with ASME B31.5, Chapter VI.
  2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure. Test piping in accordance with the Mechanical Code of New York State.
  3. Test high and low pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
    - a. Fill system with nitrogen to the required test pressure.
    - b. System shall maintain test pressure at the manifold gage throughout duration of test.
    - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

### 3.7 SYSTEM CHARGING

- A. Charge system using the following procedures:
  1. Install core in filter dryers after leak test but before evacuation.
  2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
  3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
  4. Charge system with a new filter-dryer core in charging line.

### 3.8 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high and low pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set point temperature of air conditioning or chilled water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
  - 1. Open shutoff valves in condenser water circuit.
  - 2. Verify that compressor oil level is correct.
  - 3. Open compressor suction and discharge valves.
  - 4. Open refrigerant valves except bypass valves that are used for other purposes.
  - 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

## SECTION 233113 - METAL DUCTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch wg (minus 500 to plus 2500 Pa). Metal ducts include the following:
  - 1. Rectangular ducts and fittings.
  - 2. Single-wall round spiral-seam ducts and formed fittings.
  - 3. Sheet metal materials.
  - 4. Sealants and gaskets.
  - 5. Hangers and supports.
  - 6. Seismic-restraint devices.
- B. Related Sections include the following:
  - 1. Section 230593 "Testing, Adjusting, and Balancing for HVACR" for testing, adjusting, and balancing requirements for metal ducts.
  - 2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

#### 1.3 DEFINITIONS

- A. NUSIG: National Uniform Seismic Installation Guidelines.

#### 1.4 SYSTEM DESCRIPTION

- A. Duct system design, as indicated, has been used to select size and type of air-moving and -distribution equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

#### 1.5 SUBMITTALS

- A. Shop Drawings: CAD-generated and drawn to 1/4 inch equals 1 foot. Show fabrication and installation details for metal ducts.

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
  2. Duct layout indicating sizes and pressure classes.
  3. Elevations of top and bottom of ducts.
  4. Dimensions of main duct runs from building grid lines.
  5. Fittings.
  6. Reinforcement and spacing.
  7. Seam and joint construction.
  8. Penetrations through fire-rated and other partitions.
  9. Equipment installation based on equipment being used on Project.
  10. Duct accessories, including access doors and panels.
  11. Hangers and supports, including methods for duct and building attachment, vibration isolation, and seismic restraints.
- B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Ceiling suspension assembly members.
  2. Other systems installed in same space as ducts.
  3. Ceiling- and wall-mounting access doors and panels required to provide access to dampers and other operating devices.
  4. Ceiling-mounting items, including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- C. Welding certificates.
- D. Field quality-control test reports.

## 1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel," for hangers and supports and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. NFPA Compliance:
1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
  2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- C. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Ch. 3, "Duct System," for range hood ducts, unless otherwise indicated.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

## 2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
- B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).
- C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
  1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.
- D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support

intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.

- E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.4 SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 (Z275) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.
- C. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, matte finish for exposed ducts.
- D. Aluminum Sheets: ASTM B 209 (ASTM B 209M), alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.
- F. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

## 2.5 SEALANT MATERIALS

- A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.
- B. Joint and Seam Tape: 2 inches (50 mm) wide; glass-fiber-reinforced fabric.
- C. Tape Sealing System: Woven-fiber tape impregnated with gypsum mineral compound and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
- D. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for Class 1 ducts.

- E. Solvent-Based Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant formulated with a minimum of 75 percent solids.
- F. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.
- G. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

## 2.6 HANGERS AND SUPPORTS

- A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
  - 1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
  - 2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
- B. Hanger Materials: Galvanized sheet steel or threaded steel rod.
  - 1. Hangers Installed in Corrosive Atmospheres: Electro-galvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
  - 2. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.
  - 3. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.
  - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
  - 2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.
  - 3. Supports for Aluminum Ducts: Aluminum support materials unless materials are electrolytically separated from ducts.

## 2.7 SEISMIC-RESTRAINT DEVICES

- A. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by [an evaluation service member of the ICC Evaluation Service] [an agency acceptable to authorities having jurisdiction].
  - 1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- B. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

- C. Restraint Cables: [ASTM A 603, galvanized] [ASTM A 492, stainless]-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.
- D. Hanger Rod Stiffener: [Steel tube or steel slotted-support-system sleeve with internally bolted connections] [Reinforcing steel angle clamped] to hanger rod.
- E. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

## 2.8 RECTANGULAR DUCT FABRICATION

- A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
  - 1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
  - 2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.
  - 1. Manufacturers:
    - a. Ductmate Industries, Inc.
    - b. Nexus Inc.
    - c. Ward Industries, Inc.
    - d. McGrill AirFlow LLC.
    - e. Or Approved Equal.
- C. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.
  - 1. Manufacturers:
    - a. Ductmate Industries, Inc.
    - b. Lockformer.
    - c. McGrill AirFlow LLC.
    - d. SEMCO LLC
    - e. Or Approved Equal.
  - 2. Duct Size: Maximum 30 inches (750 mm) wide and up to 2-inch wg (500-Pa) pressure class.
  - 3. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.

- D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches (480 mm) and larger and 0.0359 inch (0.9 mm) thick or less, with more than 10 sq. ft. (0.93 sq. m) of non-braced panel area unless ducts are lined.

## 2.9 ROUND DUCT AND FITTING FABRICATION (WHERE INDICATED ON DRAWINGS)

- A. Round, Longitudinal- and Spiral Lock-Seam Ducts: Fabricate exhaust air ducts of aluminum according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

- 1. Manufacturers:

- a. McGill AirFlow Corporation.
- b. SEMCO Incorporated.
- c. Ductmate Industries, Inc.
- d. Spiral Manufacturing Co.
- e. Or Approved Equal.

- B. Duct Joints:

- 1. Ducts up to 20 Inches (500 mm) in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
- 2. Ducts 21 to 72 Inches (535 to 1830 mm) in Diameter: Three-piece, gasketed, flanged joint consisting of two internal flanges with sealant and one external closure band with gasket.
- 3. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.

- a. Manufacturers:

- 1) Ductmate Industries, Inc.
- 2) Lindab Inc.
- 3) SEMCO Incorporated.
- 4) McGill AirFlow Corporation.
- 5) Or Approved Equal.

- C. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal-seam straight ducts.

- D. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.

- E. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows shall be 1-1/2 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:

- 1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
- 2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg (minus 500 to plus 500 Pa):

- a. Ducts 3 to 36 Inches (75 to 915 mm) in Diameter: 0.034 inch (0.85 mm).
  - b. Ducts 37 to 50 Inches (940 to 1270 mm) in Diameter: 0.040 inch (1.0 mm).
3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg (500 to 2500 Pa):
- a. Ducts 3 to 26 Inches (75 to 660 mm) in Diameter: 0.034 inch (0.85 mm).
  - b. Ducts 27 to 50 Inches (685 to 1270 mm) in Diameter: 0.040 inch (1.0 mm).
4. Round Elbows 8 Inches (200 mm) and Less in Diameter: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
5. Round Elbows 9 through 14 Inches (225 through 355 mm) in Diameter: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees unless space restrictions require mitered elbows. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
6. Die-Formed Elbows for Sizes through 8 Inches (200 mm) in Diameter and All Pressures 0.040 inch (1.0 mm) thick with 2-piece welded construction.
7. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.
8. Pleated Elbows for Sizes through 14 Inches (355 mm) in Diameter and Pressures through 10-Inch wg (2500 Pa): 0.022 inch (0.55 mm).

## PART 3 - EXECUTION

### 3.1 DUCT APPLICATIONS

- A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:
  - 1. Return Ducts (Negative Pressure): 2 inch wg.
  - 2. Exhaust Ducts (Negative Pressure): 2-inch wg.
- B. All ducts shall be galvanized steel except exhaust air duct for chemical fume hood shall be aluminum construction.

### 3.2 DUCT INSTALLATION

- A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
- B. Install round ducts in lengths not less than 12 feet (3.7 m) unless interrupted by fittings.
- C. Install ducts with fewest possible joints.
- D. Install fabricated fittings for changes in directions, size, and shape and for connections.

- E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches (300 mm), with a minimum of 3 screws in each coupling.
- F. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
- I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.
- J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
- K. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.
- L. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches (38 mm).
- N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Division 23 Section "Air Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Section "078443 Through-Penetration Firestop Systems."
- O. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes. Refer to SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
- P. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."
- Q. Paint interiors of metal ducts, that do not have duct liner, for 24 inches (600 mm) upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

### 3.3 SEAM AND JOINT SEALING

- A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.
  - 1. For pressure classes lower than 2-inch wg (500 Pa), seal transverse joints.

- B. Seal ducts before external insulation is applied.

### 3.4 HANGING AND SUPPORTING

- A. Support horizontal ducts within 24 inches (600 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.
- B. Support vertical ducts at maximum intervals of 16 feet (5 m) and at each floor.
- C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.
- D. Install concrete inserts before placing concrete.
- E. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
  - 1. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.

### 3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors according to Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

### 3.6 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections according to SMACNA's "HVAC Air Duct Leakage Test Manual" and prepare test reports:
  - 1. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
  - 2. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.
  - 3. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (500 Pa) (both positive and negative pressures), and Leakage Class 6 for pressure classes from 2- to 10-inch wg (500 to 2500 Pa).
  - 4. Remake leaking joints and retest until leakage is equal to or less than maximum allowable.

### 3.7 CLEANING NEW SYSTEMS

- A. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.

- B. Use service openings, as required, for physical and mechanical entry and for inspection.
  - 1. Create other openings to comply with duct standards.
  - 2. Disconnect flexible ducts as needed for cleaning and inspection.
  - 3. Remove and reinstall ceiling sections to gain access during the cleaning process.
- C. Vent vacuuming system to the outside. Include filtration to contain debris removed from HVAC systems, and locate exhaust down wind and away from air intakes and other points of entry into building.
- D. Clean the following metal duct systems by removing surface contaminants and deposits:
  - 1. Air outlets and inlets (registers, grilles, and diffusers).
  - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
  - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
  - 4. Coils and related components.
  - 5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.
  - 6. Supply-air ducts, dampers, actuators, and turning vanes.
- E. Mechanical Cleaning Methodology:
  - 1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
  - 2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
  - 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts or duct accessories.
- F. Cleanliness Verification:
  - 1. Visually inspect metal ducts for contaminants.
  - 2. Where contaminants are discovered, re-clean and reinspect ducts.

END OF SECTION 233113



## SECTION 233300 - AIR DUCT ACCESSORIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Manual volume dampers.
  - 2. Control dampers.
  - 3. Fire dampers.
  - 4. Flange connectors.
  - 5. Turning vanes.
  - 6. Flexible connectors.
  - 7. Flexible ducts.

#### 1.3 ACTION SUBMITTALS

- A. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
  - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
    - a. Special fittings.
    - b. Manual volume damper installations.
    - c. Control-damper installations.
    - d. Fire-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.
- B. Source quality-control reports.

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

### 2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
  - 1. Galvanized Coating Designation: G90 (Z275).
- B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- C. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

### 2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
  - 1. Standard leakage rating, with linkage outside airstream.
  - 2. Suitable for horizontal or vertical applications.
  - 3. Frames:
    - a. Frame: Hat-shaped, 0.094-inch- (2.4-mm-) thick, galvanized sheet steel.
    - b. Mitered and welded corners.
    - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
  - 4. Blades:
    - a. Multiple or single blade.
    - b. Parallel- or opposed-blade design.
    - c. Stiffen damper blades for stability.
    - d. Galvanized-steel, 0.064 inch (1.62 mm) thick.
  - 5. Blade Axles: Galvanized steel.
  - 6. Bearings:

- a. Oil-impregnated bronze.
  - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
- 7. Tie Bars and Brackets: Galvanized steel.
- B. Low-Leakage, Steel, Manual Volume Dampers:
  - 1. Comply with AMCA 500-D testing for damper rating.
  - 2. Low-leakage rating with linkage outside airstream and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
  - 3. Suitable for horizontal or vertical applications.
  - 4. Frames:
    - a. Angle shaped.
    - b. 0.094-inch- (2.4-mm-) thick, galvanized sheet steel.
    - c. Mitered and welded corners.
    - d. Flanges for attaching to walls and flangeless frames for installing in ducts.
  - 5. Blades:
    - a. Multiple or single blade.
    - b. Parallel- or opposed-blade design.
    - c. Stiffen damper blades for stability.
    - d. Galvanized, roll-formed steel, 0.064 inch (1.62 mm) thick.
  - 6. Blade Axles: Galvanized steel.
  - 7. Bearings:
    - a. Oil-impregnated bronze.
    - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
  - 8. Blade Seals: Neoprene.
  - 9. Jamb Seals: Cambered aluminum.
  - 10. Tie Bars and Brackets: Galvanized steel.
  - 11. Accessories:
    - a. Include locking device to hold single-blade dampers in a fixed position without vibration.

## 2.4 FIRE DAMPERS

- A. Type: Static; rated and labeled according to UL 555 by an NRTL.
- B. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 2000-fpm (10-m/s) velocity.
- C. Fire Rating: 1-1/2 hours.
- D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.
- E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.39 inch (9.9 mm) thick, as indicated, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.

H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

I. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.

## 2.5 FLANGE CONNECTORS

A. Description: roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

B. Material: Galvanized steel.

C. Gage and Shape: Match connecting ductwork.

## 2.6 FLEXIBLE CONNECTORS

A. Materials: Flame-retardant or noncombustible fabrics.

B. Coatings and Adhesives: Comply with UL 181, Class 1.

C. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install volume dampers at points on supply and return systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
  - 1. Install steel volume dampers in steel ducts.
  - 2. Install aluminum volume dampers in aluminum ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Install fire dampers according to UL listing.
- G. Install flexible connectors to connect ducts to equipment.
- H. Connect terminal units to supply ducts with maximum 6-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- I. Connect flexible ducts to metal ducts with [adhesive plus sheet metal screws.
- J. Install duct test holes where required for testing and balancing purposes.
- K. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch (6-mm) movement during start and stop of fans.

### 3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Operate dampers to verify full range of movement.
  - 2. Inspect locations of access doors and verify that purpose of access door can be performed.
  - 3. Operate fire dampers to verify full range of movement and verify that proper heat-response device is installed.
  - 4. Inspect turning vanes for proper and secure installation.
  - 5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 233300



## SECTION 233416 – CENTRIFUGAL HVAC FANS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Exhaust Fans.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan performance ratings on sea level.
- B. Operating Limits: Classify according to AMCA 99.

#### 1.4 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
  - 1. Certified fan performance curves with system operating conditions indicated.
  - 2. Certified fan sound-power ratings.
  - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
  - 4. Material thickness and finishes, including color charts.
  - 5. Dampers, including housings, linkages, and operators.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Coordination Drawings: Show fan room layout and relationships between components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate and certify field measurements.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For centrifugal fans to include in emergency, operation, and maintenance manuals.

## 1.5 QUALITY ASSURANCE

- A. AMCA compliance is an optional requirement and not necessarily available from all manufacturers.
- B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.
- C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA 1.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations, with protective crating and covering.
- B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.

## 1.7 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

## PART 2 - PRODUCTS

### 2.1 CENTRIFUGAL FANS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on the drawings or approved equal:
  - 1. Greenheck
  - 2. Loren Cook
  - 3. CaptiveAir Systems
  - 4. Or Approved Equal
- D. Exhaust Fans – Model G:

1. Model G Roof exhaust fans shall be centrifugal direct drive type. The fan housing and shroud shall be constructed of heavy gauge aluminum with a rigid internal support structure. The fan shroud shall have a rolled bead for added strength.
2. The fan wheel shall be centrifugal 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.
3. Motors shall be mounted out of the airstream on vibration isolators. Fresh air for motor cooling shall be drawn into the motor compartment from an area free of discharge contaminants. Motors shall be readily accessible for maintenance.
4. A disconnect switch shall be factory installed and wired from the motor compartment for ease of electrical wiring. Galvanized rigid wire protects the fan's discharge from birds or small objects.
5. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance.
6. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.
7. Fan shall be Model G as manufactured by Greenheck or approved equal.

## 2.2 SOURCE QUALITY CONTROL

- A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install centrifugal fans level and plumb.
- B. Support suspended units from structure using threaded steel rods and vibration isolators.
- C. Install units with clearances for service and maintenance.
- D. Label fans according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

### 3.2 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct

connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."

- B. Install ducts adjacent to fans to allow service and maintenance.

### 3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.
10. Remove and replace malfunctioning units and retest as specified above.

- B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 233416

## SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.
- B. Related Sections include the following:
  - 1. Division 23 Section "Air Duct Accessories" for fire dampers and volume-control dampers not integral to diffusers, registers, and grilles.

#### 1.3 SUBMITTALS

- A. Product Data: For each product indicated, include the following:
  - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
  - 2. Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.
- B. Coordination Drawings ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Ceiling suspension assembly members.
  - 2. Method of attaching hangers to building structure.
  - 3. Size and location of initial access modules for acoustical tile.
  - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
  - 5. Duct access panels.
- C. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.
- D. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  - 2. Products: Subject to compliance with requirements, provide one of the products specified.
  - 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.2 DIFFUSERS AND REGISTERS

- A. Manufacturers:
  - 1. Titus
  - 2. Anemostat; a Mestek Company
  - 3. Carnes
  - 4. Approved Equal
- B. **Refer to drawings for types of diffusers, registers and grilles in this project. Model #'s and Mfr's names have been provided on the drawings.**

### 2.3 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.

- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

### 3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713



## SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes split-DX heat pump and air conditioning units.

#### 1.3 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.
- F. Warranty: Special warranty specified in this Section.

#### 1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- C. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

#### 1.5 COORDINATION

- A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete."

## 1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Filters: One set of filters for each unit.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Daikin Applied
  - 2. Mitsubishi
  - 3. Fujitsu
  - 4. LG HVAC
  - 5. Or Approved Equal.

### 2.2 UNITS

- A. System Description: The Air Conditioner system shall be a Trane split system with Variable Speed Inverter Compressor technology. The system shall consist of a horizontal discharge, single phase outdoor unit, matched capacity indoor cassette units that shall be equipped with a wired wall mounted, wireless wall mounted remote controller. **Refer the drawings and mechanical schedules for types of models of units.**
- B. Quality Assurance:
  - 1. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.
  - 2. All wiring shall be in accordance with the National Electrical Code (N.E.C.) and local codes as required.
  - 3. The units shall be rated in accordance with Air-conditioning, Heating, and Refrigeration Institute's (AHRI) Standard 210 and bear the ARI Certification label.
  - 4. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
  - 5. A dry air holding charge shall be provided in the indoor section.
  - 6. The outdoor unit shall be pre-charged with R-410a refrigerant for 70 feet (20 meters) of refrigerant tubing.

7. System efficiency shall meet or exceed SEER values as scheduled on the plans.

C. Delivery, Storage and Handling:

1. Unit shall be stored and handled according to the manufacturer's recommendations.
2. The controller shall be shipped separately and shall be able to withstand 105°F storage temperatures and 95% relative humidity without adverse effect.

D. Warranty:

1. 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.
2. Manufacturer shall have over thirty (30) years of continuous experience in the U.S. market.

E. Outdoor Unit Design:

1. The outdoor unit shall be equipped with an electronic control board that interfaces with the indoor unit to perform all necessary operation functions.
2. The outdoor unit shall be capable of cooling operation down to 0°F (-18°C) ambient temperature without additional low ambient controls (optional wind baffle shall be required).
3. The outdoor unit shall be able to operate with a maximum height difference of 100 feet between indoor and outdoor units.
4. System shall operate at up to a maximum refrigerant tubing length of 165 feet (50 meters) for the 36,000 units between indoor and outdoor units without the need for line size changes, traps or additional oil.
5. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.
6. Outdoor unit sound level shall not exceed 48dB (A).

F. 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.

5. Cabinet mounting and construction shall be sufficient to withstand 155 MPH wind speed conditions for use in Hurricane condition areas. Mounting, base support, and other installation to meet Hurricane Code Conditions shall be by others.

G. Fan:

1. Each unit shall be furnished with a single DC fan motor.
2. The fan blade(s) shall be of aerodynamic design for quiet operation, and 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.

H. Coil:

1. The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up and allow maximum airflow. 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 controlled 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 E 84 and CAN / ULC S-102.

I. Compressor:

1. The compressor 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.

J. Electrical:

1. The electrical power of the unit shall be 208volts, single phase, 60 hertz. The unit shall be capable of satisfactory operation within voltage limits of 187 volts to 253 volts.
2. Power for the indoor unit shall be supplied from the outdoor unit via Mitsubishi Electric A-Control using three (3) fourteen (14) gauge AWG conductors plus ground wire connecting the units.
3. The outdoor unit shall be controlled by the microprocessor located in the indoor unit. The control signal between the indoor unit and the outdoor unit shall be pulse signal 24 volts DC.
4. The unit shall have Pulse Amplitude Modulation circuit to utilize 98% of input power supply.

K. Operating Range:

1. The Cooling Operating Temperature Range shall be 0°F to 118°F.
2. The Heating Operating Temperature Range shall be -4°F to 78°F.

L. 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.

M. Fan:

1. The indoor unit fan shall be high performance, double inlet, forward curve, direct drive sirocco 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: Low, Mid, and Hi and Auto. 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.

O. 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 significantly decrease downward air resistance for lower sound levels, and shall close the outlet port when operation is stopped. There shall also be a set of vertical vanes to provide horizontal swing airflow movement.

P. Filter:

1. Return air shall be filtered by means of an easily removable washable filter.

Q. Coil:

1. The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. The multi-angled heat exchanger shall have a modified fin shape

that reduces air resistance for a smoother, quieter airflow. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil. An optional drain pan level switch (DPLS1), designed to connect to the control board, shall be provided if required, and installed on the condensate pan to prevent condensate from overflowing.

R. Electrical:

1. The electrical power of the unit shall be 208 volts, 1 phase, 60 hertz. The system shall be capable of satisfactory operation within voltage limits of 187 volts to 253 volts. The power to the indoor unit shall be supplied from the outdoor unit, using the Mitsubishi Electric A-Control system. For A-Control, a three (3) conductor AWG-14 wire with ground shall provide power feed and bi-directional control transmission between the outdoor and indoor units.

S. Performance:

1. Each system shall perform in accordance to the ratings shown in the manufacturer catalog. Cooling performance shall be based on 80°F DB, 67°F WB (26.7°C DB, 19.4°C WB) for the indoor unit and 95°F DB, 75°F WB (35°C DB, 29.3°C WB) for the outdoor unit.

T. System Control:

1. The control system shall consist of a minimum of two (2) microprocessors, one on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from a wireless or wired controller, providing emergency operation and controlling the outdoor unit. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC. Indoor units shall have the ability to control supplemental heat via connector CN152 and a 12 VDC output.

U. System Control: The indoor unit control board shall have auxiliary control contact connectors.

V. Remote Controllers: All remote controllers need to be ordered separately from the unit. Provide remote controllers as called out on the drawings and mechanical schedules.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install in-door units using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install roof-mounting outdoor units on equipment supports. Anchor units to supports with removable, cadmium-plated fasteners.
- D. Install seismic restraints.

- E. Install outdoor units on restrained, spring isolators with a minimum static deflection of 1 inch. Refer to Division 23 Section "Mechanical Vibration and Seismic Controls."
- F. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

### 3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to unit to allow service and maintenance.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding."
- D. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

### 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.

### 3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.

### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 1 Section "Closeout Procedures / Demonstration and Training."

END OF SECTION 238126



## SECTION 238219 - FAN COIL UNITS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes ductless fan coil units and accessories.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
  - 1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Include diagrams for power, signal, and control wiring.
- C. Samples: For units with factory-applied color finishes.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale and coordinated with each other based on input from installers of the items involved:
- B. Seismic Qualification Certificates: For fan coil units, accessories, and components, from manufacturer.
- C. Field quality-control reports.
- D. Sample warranty.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

#### 1.5 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Factory-packaged and -tested units rated according to AHRI 440, ASHRAE 33, and UL 1995.

### 2.2 FAN COIL UNITS

- A. Fan Coil Unit Configurations: Horizontal .
  - 1. Number of Rows Heating Coil: Two.
- B. Coil Section Insulation: 1/2-inch thick, coated glass fiber complying with ASTM C 1071 and attached with adhesive complying with ASTM C 916.
  - 1. Surface-Burning Characteristics: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84 by a qualified testing agency.
  - 2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
  - 3. Surface-Burning Characteristics: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84 by a qualified testing agency.
  - 4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- C. Chassis: With baked-enamel finish and removable access panel.
- D. Cabinet: Steel with factory prime coating, ready for field painting.
  - 1. Vertical Unit Front Panels: Removable, steel, with integral stamped discharge grille and channel-formed edges, cam fasteners, and insulation on back of panel.
  - 2. Horizontal Unit Bottom Panels: Fastened to unit with cam fasteners and hinge and attached with safety chain; with integral stamped discharge grilles.
  - 3. Steel recessing flanges for recessing fan coil units into ceiling or wall.
- E. Filters: Minimum arrestance and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2 and all addendums.
  - 1. Pleated Cotton-Polyester Media: 90 percent arrestance and MERV 8.
- F. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than **0.1 inch**, rated for a minimum working pressure of **200 psig** and a maximum entering-water temperature of **220 deg F** . Include manual air vent and drain valve.
- G. Fan and Motor Board: Removable.

1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.
  2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
  3. Wiring Termination: Connect motor to chassis wiring with plug connection.
- H. Factory, Hydronic Piping Package: ASTM B 88, Type L copper tube with wrought-copper fittings and brazed joints. Label piping to indicate service, inlet, and outlet.
1. Three-way, control valve for hot-water heating coil.
  2. Hose Kits: Minimum 400-psig working pressure and operating temperatures from 33 to 211 deg F. Tag hose kits to equipment designations.
    - a. Length: 24 inches.
    - b. Minimum Diameter: Equal to fan coil unit connection size.
  3. Two-Piece Ball Valves: Bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig minimum CWP rating and blowout-proof stem.
  4. Calibrated-Orifice Balancing Valves: Bronze body, ball type; 125-psig working pressure, 250 deg F maximum operating temperature; with calibrated orifice or venturi, connections for portable differential pressure meter with integral seals, threaded ends, and a memory stop to retain set position.
  5. Automatic Flow-Control Valve: Brass or ferrous-metal body; 300-psig working pressure at 250 deg F; with removable, corrosion-resistant, tamperproof, self-cleaning piston spring; factory set to maintain constant indicated flow with plus or minus 10 percent over differential pressure range of 2 to 80 psig.
  6. Y-Pattern Hydronic Strainers: Cast-iron body (ASTM A 126, Class B); 125-psig working pressure; with threaded connections, bolted cover, perforated stainless-steel basket, and bottom drain connection. Include minimum NPS ½ hose-end, full-port, ball-type blowdown valve in drain connection.
  7. Wrought-Copper Unions: ASME B16.22.
- I. Basic Unit Controls:
1. Control voltage transformer.
  2. Wall-mounting thermostat with the following features:
    - a. Heat-off switch.
    - b. Fan on-auto switch.
    - c. Fan-speed switch.
    - d. Adjustable deadband.
    - e. Exposed set point.
  3. Wall-mounting Thermostat
- J. Electrical Connection: Factory wire motors and controls for a single electrical connection.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install fan coil units level and plumb.
- B. Install fan coil units to comply with NFPA 90A.
- C. Suspend fan coil units from structure with elastomeric hangers. Vibration isolators are specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."
- D. Install new filters in each fan coil unit within two weeks after Substantial Completion.
- E. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:
  - 1. Install piping adjacent to machine to allow service and maintenance.
  - 2. Connect piping to fan coil unit factory hydronic piping package. Install piping package if shipped loose.

### 3.2 ADJUSTING

- A. Adjust initial temperature set points.

END OF SECTION 238219

## SECTION 238236 - FINNED-TUBE RADIATION HEATERS

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. Section includes hydronic finned-tube radiation heaters.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings:
  - 1. Include plans, elevations, sections, and details.
  - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include details and dimensions of custom-fabricated enclosures.
  - 4. Indicate location and size of each field connection.
  - 5. Indicate location and arrangement of piping valves and specialties.
  - 6. Indicate location and arrangement of integral controls.
  - 7. Include enclosure joints, corner pieces, access doors, and other accessories.
  - 8. Include diagrams for power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Color Samples for Initial Selection: For finned-tube radiation heaters with factory-applied color finishes.
- E. Color Samples for Verification: For each type of exposed finish.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Structural members, including wall construction, to which finned-tube radiation heaters will be attached.

2. Method of attaching finned-tube radiation heaters to building structure.
3. Penetrations of fire-rated wall and floor assemblies.

B. Field quality-control reports.

## PART 2 - PRODUCTS

### 2.1 BASEBOARD RADIATION HEATERS

#### A. APPROVED MANUFACTURERS

1. Sterling HVAC Products
2. Engineered Air
3. Zehnder Rittling
4. Or Approved Equal

B. Performance Ratings: Rate baseboard radiation heaters according to Hydronics Institute's "I=B=R Testing and Rating Standard for Baseboard Radiation."

C. Heating Elements: Copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins resting on polypropylene element glides. One end of tube shall be belled.

D. Enclosures: Minimum 14-gauge steel, removable front cover.

1. Full-height back.
2. Full-length damper.
3. End panel.
4. End caps.
5. Inside and outside corners.
6. Valve access door.
7. Joiner pieces to snap together.
8. Enclosure Height: Refer to drawings and schedule.
9. Enclosure Depth: Refer to drawings and schedule.
10. Finish: Baked-enamel finish in manufacturer's standard color as selected by Architect.
11. Element Brackets: Primed and painted steel to support front panel and element.

### 2.2 FINNED-TUBE RADIATION HEATERS

#### A. APPROVED MANUFACTURERS

1. Sterling HVAC Products
2. Engineered Air
3. Zehnder Rittling
4. Or Approved Equal

B. Performance Ratings: Rate finned-tube radiation heaters according to Hydronics Institute's "I=B=R Testing and Rating Standard for Finned-Tube (Commercial) Radiation."

C. Heating Elements: Copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins resting on element supports. One end of tube shall be belled.

- D. Element Supports: Ball-bearing cradle type to permit longitudinal movement on enclosure brackets.
- E. Front Panel: Minimum 14-gauge steel.
- F. Wall-Mounted Back Panel: Minimum 18-gauge steel, full height, with full-length channel support for front panel without exposed fasteners.
- G. Support Brackets: Locate at maximum 36-inch spacing to support front panel and element.
- H. Finish: Baked-enamel finish in manufacturer's standard color as selected by Architect.
- I. Damper: Knob-operated internal damper at enclosure outlet.
- J. Access Doors: Factory made, permanently hinged with tamper-resistant fastener, minimum size 6 by 7 inches, integral with enclosure.
- K. Enclosure Style & Dimensions: Refer to drawings and schedule.
- L. Accessories: Filler sections, corners, relay sections, and splice plates all matching the enclosure and grille finishes.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas to receive finned-tube radiation heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for hydronic-piping connections to verify actual locations before installation of finned-tube radiation heaters.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 BASEBOARD RADIATION HEATER INSTALLATION

- A. Install units level and plumb.
- B. Install enclosure continuously around corners, using outside and inside corner fittings.
- C. Join sections with splice plates and filler pieces to provide continuous enclosure.
- D. Install access doors for access to valves.
- E. Install enclosure continuously from wall to wall.
- F. Terminate enclosures with manufacturer's end caps except where enclosures are indicated to extend to adjoining walls.
- G. Install valves within reach of access door provided in enclosure.

- H. Install air-seal gasket between wall and recessed flanges or front cover of fully recessed unit.
- I. Install piping within pedestals for freestanding units.

### 3.3 FINNED-TUBE RADIATION HEATER INSTALLATION

- A. Install units level and plumb.
- B. Install enclosure continuously around corners, using outside and inside corner fittings.
- C. Join sections with splice plates and filler pieces to provide continuous enclosure.
- D. Install access doors for access to valves.
- E. Install enclosure continuously from wall to wall.
- F. Terminate enclosures with manufacturer's end caps except where enclosures are indicated to extend to adjoining walls.
- G. Install valves within reach of access door provided in enclosure.
- H. Install air-seal gasket between wall and recessed flanges or front cover of fully recessed unit.

### 3.4 CONNECTIONS

- A. Piping installation requirements are specified in Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect hot-water finned-tube radiation heaters and components to piping according to Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties."
  - 1. Install shutoff valves on inlet and outlet, and balancing valve on outlet.
- C. Install control valves as indicated on drawings.
- D. Install piping adjacent to finned-tube radiation heaters to allow service and maintenance.
- E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### 3.5 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- B. Units will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 238236



## SECTION 238239 - CABINET UNIT HEATERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes cabinet unit heaters with centrifugal fans and hot-water coils.

#### 1.3 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 1. Plans, elevations, sections, and details.
  - 2. Location and size of each field connection.
  - 3. Location and arrangement of piping valves and specialties.
  - 4. Location and arrangement of integral controls.
  - 5. Wiring Diagrams: Power, signal, and control wiring.
- C. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Suspended ceiling components.
  - 2. Structural members to which cabinet unit heaters will be attached.
  - 3. Method of attaching hangers to building structure.
  - 4. Size and location of initial access modules for acoustical tile.
  - 5. Items penetrating finished ceiling, including the following:
    - a. Lighting fixtures.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Sprinklers.
    - e. Access panels.
  - 6. Perimeter moldings for exposed or partially exposed cabinets.
- D. Samples for Initial Selection: Finish colors for units with factory-applied color finishes.

- E. Samples for Verification: Finish colors for each type of cabinet unit heater indicated with factory-applied color finishes.
- F. Manufacturer Seismic Qualification Certification: Submit certification that cabinet unit heaters, accessories, and components will withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC piping and Equipment." Include the following:
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- G. Field quality-control test reports.
- H. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

#### 1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

#### 1.5 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Cabinet Unit Heater Filters: Furnish 1 spare filter for each filter installed.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURED UNITS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Trane.
  2. Sterling.
  3. Carrier Corporation.
  4. Markel Products; a division of TPI Corporation.
  5. Marley Electric Heating; a division of Marley Engineered Products.
  6. QMark Electric Heating; a division of Marley Engineered Products.
  7. Or Approved Equal.
- D. Description: A factory-assembled and -tested unit complying with ARI 440.
1. Comply with UL 2021.
- E. Coil Section Insulation: ASTM C 1071; surfaces exposed to air stream shall be aluminum-foil facing to prevent erosion of glass fibers.
1. Thickness: 1/2 inch / 1 inch.
  2. Thermal Conductivity (k-Value): 0.26 Btu x in./h x sq. ft. at 75 deg F (0.037 W/m x K at 24 deg C) mean temperature.
  3. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
  4. Adhesive: Comply with ASTM C 916 and with NFPA 90A or NFPA 90B.
- F. Cabinet: Steel with baked-enamel finish with manufacturer's standard paint, in color selected by Owner/Architect.
1. Horizontal Unit, Exposed Bottom Panels: Minimum 0.0528-inch-thick, galvanized, sheet steel, removable panels secured with tamperproof cam fasteners and safety chain.
  2. Recessing Flanges: Steel, finished to match cabinet.
  3. Control Access Door: Key operated.
    - a. Outdoor-Air Damper: Galvanized-steel blades with edge and end seals and nylon bearings; with electronic, two-position actuators.
- G. Filters: Minimum arrestance according to ASHRAE 52.1 and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
1. Washable Foam: 70 percent arrestance and 3 MERV.
  2. Glass Fiber Treated with Adhesive: 80 percent arrestance and 5 MERV.
  3. Pleated: 90 percent arrestance and 7 MERV.
- H. Hot-Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch (2.5 mm) and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain.
- I. Fan and Motor Board: Removable.
1. Fan: Forward curved, double width; directly connected to ECM motor. Aluminum or galvanized-steel fan scrolls.
  2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
  3. Wiring Terminations: Connect motor to chassis wiring with plug connection.

- J. Factory, Hot-Water Piping Package: ASTM B 88, Type L copper tube with wrought-copper fittings and brazed joints. Label piping to indicate service, inlet and outlet.
1. Three-way, modulating control valve. Three-way valve packages shall include bypass line with manually adjustable balance device.
  2. Two-Piece, Ball Valves: Bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig (4140-kPa) minimum CWP rating and blowout-proof stem.
  3. Calibrated-Orifice Balancing Valves: Bronze body, ball type, 125-psig (860-kPa) working pressure, 250 deg F (121 deg C) maximum operating temperature; with calibrated orifice or venture, connection for portable differential pressure meter with integral seals, threaded ends, and equipped with a memory stop to retain set position.
  4. Y-Pattern, Hot-Water Strainers: Cast-iron body (ASTM A 126, Class B); 125-psig (860-kPa) minimum working pressure; with threaded connections, bolted cover, perforated stainless-steel basket, and bottom drain connection. Include minimum NPS 1/2 (DN 15) threaded pipe and full-port ball valve in strainer drain connection.
  5. Wrought-Copper Unions: ASME B16.22.
- K. Control devices and operational sequences are specified in Division 23 Sections "HVAC Instrumentation and Controls."
- L. Unit Controls:
1. Factory installed/field installed controller shall be provided by mechanical contractor and installed by DDC subcontractor.
- M. Electrical Connection: Factory wire motors and controls for a single field connection.
- N. Capacities and Characteristics:
1. Fan:
    - a. Airflow: See drawings.
    - b. External Static Pressure: See drawings.
    - c. Motor Horsepower: See drawings.
  2. Heating Capacity:
    - a. Output: See drawings.
    - b. Entering-Air Temperature: See drawings.
    - c. Air-Temperature Rise: See drawings.
  3. Hot-Water Heating Coil:
    - a. Water Flow: See drawings.
    - b. Water-Side Pressure Loss: See drawings.
    - c. Entering-Water Temperature: See drawings.
  4. Filters:
    - a. Thickness: 1 inch.

5. Electrical Characteristics for Single-Point Connection:

- a. Volts: See drawings.
- b. Phase: See drawings.
- c. Hertz: See drawings.
- d. Full-Load Amperes: See drawings.

2.2 CABINET HEATERS:

- A. Performance Data: Capacity – Unit capacities shall be in accordance with Industry Room Fan-Coil Air-Conditioner Certification Program under ARI Standard 440-97. Safety – All standard units shall be UL listed. Units shall comply with NFPA90A requirements.
- B. All Units – The unit shall include a chassis, coil, fan wheel(s), fan casing(s), fan board and motor(s). The fan board assembly shall be easily removable. The fan board assembly shall include a quick-disconnect motor plug. The chassis construction shall be 18-gauge galvanized steel, and continuous throughout the unit. The unit shall be acoustically and thermally insulated with closed-cell insulation. All panels shall be made rigid by channel forming.
- C. Vertical Cabinet Units: Front panel fabrication shall be 16-gauge galvanized steel. All other panels shall be 18-gauge galvanized steel. Hinged access door construction shall be 20-gauge steel and shall be flush with top panel.
- D. Unit Finish: All cabinet parts and exposed recessed panels shall be cleaned, bonderized, phosphatized, and painted with a baked powder finish available in six decorator colors. Standard finish meets ASTM B117 specifications (salt spray test).
- E. Fans – The galvanized metal fan wheels shall be centrifugal forward-curved and double-width. Fan wheels and housings shall be corrosion resistant. Fan housing construction shall be formed sheet metal.
- F. Motors – All motors shall be brushless DC (BLDC)/electronically commutated motors (ECM) factory-programmed and run-tested in assemblies units. The motor controller shall be mounted in a touch-safe control box with a built-in integrated user interface and LED tachometer. If adjustments shall be needed, motor parameters can be adjusted through momentary contact switches accessible without factory service personnel on the motor control board.

Motors shall soft-ramp between speeds to lessen the acoustics due to sudden speed changes. Motors shall be operated at three speeds or with a field-supplied variable speed controller. The motor shall choose the highest speed if there are simultaneous/conflicting speed requests.

All motors shall have integral thermal overload protection with a maximum ambient operating temperature of 104°F and shall be permanently lubricated. Motors shall be capable of starting at 50 percent protection with a maximum ambient operating temperature of 104 F and shall be permanently lubricated. Motors shall be capable of starting at 78 percent of rated voltage and operating at 90 percent of rated voltage on all speed settings. Motors shall be able to operate up to 10 percent over voltage.

- G. Control Interface: The control interface shall be intended to be used with a field-supplied, low-voltage thermostat or controller. The control box shall contain a relay board which shall include a line voltage to 24-volt transformer, and an optional disconnect switch. All end devices shall be wired to a low-voltage terminal block and shall be run-tested, so the only a power connection

and thermostat/controller connection shall be needed to commission the unit. Changeover sensors and controls shall be provided whenever a change-over coil is selected. When N.O. valves are selected, inverting relays shall be provided for use with standard thermostats.

- H. Fan Speed Switch: The fan speed switch shall be available with or without the control interface option and shall be available as unit-mount. The unit-mount FSS shall employ low-voltage fan switches. However, the low-voltage fan speed option shall provide an interface to factory wiring, including variable-speed/high-medium-low (HML) control. The control box shall contain a line voltage to 24-volt transformer, ECM motor controller, and an optional disconnect switch.
- I. Hot Water Coils – Hot water coils shall be proof-tested at 350 psig (air under water) and leak tested at 125 psig (air under water). Maximum main coil working pressure shall be 300 psig. Maximum entering water temperature shall be 200 F. Tubes and u-bends shall be 3/8" (10 mm) OD copper. Fins are aluminum and shall be mechanically bonded to the copper tubes. Coil stubouts shall be 5/8" (16 mm) OD copper tubing.
- J. Piping Packages (Hot Water Coils) – All piping packages shall be proof-tested at 350 psig (air under water) and leak tested at 125 psig (air under water). The maximum working pressure of the interconnecting piping shall be 300 psig.

Piping package shall be deluxe configuration. The deluxe package shall include unions at the coil connections and a 20-mesh strainer on the supply side with a pressure rating on the strainer of up to 400 psig.

End valve options on the piping package shall include ball valves, manual circuit setters, and auto circuit setters.

- K. Ball Valve S&R, Auto Circuit Setter Return – Ball-type end valves shall be mounted on the supply and return, with an additional auto circuit setter mounted on the return. The auto circuit setter shall be an automatic flow control valve that shall be sized to allow a specific GPM through the coil. Auto circuit setters shall include two P/T plugs and have a maximum working pressure of 400 psig.
- L. Modulating Control Valves - Three-way modulating valves shall be rated for a maximum 50 psig pressure differential across the valve.
- M. Filters – Filters shall be concealed from sight and easily removable. Filters shall be located behind an integral access door on horizontal-type units. Filters shall be either 1" throwaway or 1" pleated media throwaway. Pleated media filters shall be Farr 30/30.
- N. Auto Two-Position Damper – The auto two-position damper is factory set at 25 percent when open. The damper shall be set in the field to allow from zero to 50 percent fresh air.
- O. Options:
  - 1. Disconnect Switch – A unit-mounted disconnect switch shall be available as a standard option on all units.
  - 2. Colors – Six decorator colors shall be available in a baked powder finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas to receive cabinet unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for piping and electrical connections to verify actual locations before cabinet unit heater installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install wall boxes in finished wall assembly; seal and weatherproof. Joint-sealant materials and applications are specified in Division 7 Section "Joint Sealants."
- B. Install cabinet unit heaters to comply with NFPA 90A.
- C. Suspend cabinet unit heaters from structure with elastomeric hangers and seismic restraints. Vibration isolators and seismic restraints are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- D. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above finished floor.
- E. Install new filters in each fan-coil unit within two weeks of Substantial Completion.

### 3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to machine to allow service and maintenance.
- C. Connect piping to cabinet unit heater's factory, hot-water piping package. Install the piping package if shipped loose.
- D. Connect supply and return ducts to cabinet unit heaters with flexible duct connectors specified in Division 23 Section "Air Duct Accessories."
- E. Comply with safety requirements in UL 1995.
- F. Ground equipment according to Division 26 Section "Grounding and Bonding."
- G. Connect wiring according to Division 26 Section "Low Voltage Electrical Power Conductors and Cables."

### 3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
  - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
  - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.

### 3.5 ADJUSTING

- A. Adjust initial temperature set points.
- B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to 2 visits to Project during other-than-normal occupancy hours for this purpose.

### 3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain cabinet unit heaters. Refer to Division 1.

END OF SECTION 238239

## SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Building wires and cables rated 600 V and less.
  - 2. Connectors, splices, and terminations rated 600 V and less.
  - 3. Sleeves and sleeve seals for cables.

#### 1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field quality-control test reports.

#### 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
  - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

## 1.6 COORDINATION

- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

## PART 2 - PRODUCTS

### 2.1 CONDUCTORS AND CABLES

- A. Copper Conductors: Comply with NEMA WC 70.
- B. Conductor Insulation: Comply with NEMA WC 70 for Type THHN.
- C. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC with ground wire.

### 2.2 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

### 2.3 SLEEVES FOR CABLES

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

## PART 3 - EXECUTION

### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

### 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- B. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway, Metal-clad cable, Type MC.

### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

### 3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

### 3.5 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

### 3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
  - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- C. Test Reports: Prepare a written report to record the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

## SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes: Grounding systems and equipment.

#### 1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

### PART 2 PRODUCTS

#### 2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.
  - 4. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

#### 2.2 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
  - 1. Pipe Connectors: Clamp type, sized for pipe.

- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

### 2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, 3/4 inch in diameter by 10 feet long.

## PART 3 EXECUTION

### 3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 10 AWG and smaller, and stranded conductors for No. 8 AWG and larger unless otherwise indicated.
- B. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
  - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
  - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
  - 4. Connections to Structural Steel: Welded connectors.

### 3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  - 1. Feeders and branch circuits.
  - 2. Lighting circuits.
  - 3. Receptacle circuits.
  - 4. Single-phase motor and appliance branch circuits.
  - 5. Three-phase motor and appliance branch circuits.
  - 6. Flexible raceway runs.
  - 7. Metal-clad cable runs.
  - 8. Standby generator.

9. Mechanical equipment feeders and branch circuits.

### 3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
  1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
  3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- C. Grounding and Bonding for Piping:
  1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
  2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
  3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

### 3.4 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
  3. Test completed grounding system at each location where a maximum ground-resistance level is specified, and at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.
    - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural

drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

- b. Perform tests by fall-of-potential method according to IEEE 81.
- B. Grounding system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.
- D. Report measured ground resistances that exceed the following values:
  - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
- E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

## SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Hangers and supports for electrical equipment and systems.
  - 2. Construction requirements for concrete bases.

#### 1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

#### 1.4 SUBMITTALS

- A. Product Data: For the following:
  - 1. Steel slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
  - 1. Trapeze hangers. Include Product Data for components.
  - 2. Steel slotted channel systems. Include Product Data for components.
  - 3. Equipment supports.

### PART 2 - PRODUCTS

#### 2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
  - 1. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

2. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  3. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  2. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. Retain one of first two subparagraphs and list of manufacturers below. See Division 01 Section "Product Requirements."
  3. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
  4. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
  5. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
  6. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
  7. Toggle Bolts: All-steel springhead type.
  8. Hanger Rods: Threaded steel.

## 2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

## PART 3 - EXECUTION

### 3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

### 3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, as permitted in NFPA 70.

### 3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

### 3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
- B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529



## SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

#### 1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.

#### 1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Qualification Data: For professional engineer and testing agency.
- C. Source quality-control test reports.

#### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

### PART 2 - PRODUCTS

#### 2.1 METAL CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. EMT: ANSI C80.3.
- C. Fittings for Conduit EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

- D. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

## 2.2 METAL WIREWAYS

- A. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.
- B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- C. Wireway Covers: Screw-cover type.
- D. Finish: Manufacturer's standard enamel finish.

## 2.3 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- B. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Comply with the following indoor applications, unless otherwise indicated:
  - 1. Concealed in Ceilings and Interior Walls and Partitions: EMT
  - 2. Boxes and Enclosures: NEMA 250, Type 1 stainless steel.
- B. Minimum Raceway Size: 1/2-inch (16-mm) trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.

### 3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

- E. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- G. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

END OF SECTION 260533



## SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Identification for raceways.
  - 2. Identification for conductors.
  - 3. Miscellaneous identification products.

#### 1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

#### 1.4 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

## PART 2 - PRODUCTS

### 2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
  - 1. Black letters on an orange field
  - 2. Legend: Indicate voltage.
- C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

### 2.2 METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Colors for Raceways Carrying Circuits at 600 V and Less:
  - 1. Black letters on an orange field.
  - 2. Legend: Indicate voltage.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

### 2.3 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.

- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

### 3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120V to ground: Identify with self-adhesive vinyl label. Install labels at 30-foot maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
  - 1. 120/208 volt power.
  - 2. 277/480 volt power.
  - 3. Fire alarm.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
  - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
    - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
    - b. Colors for 208/120-V Circuits:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
    - c. Colors for 480/277-V Circuits:
      - 1) Phase A: Brown.
      - 2) Phase B: Orange.

3) Phase C: Yellow.

- d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

END OF SECTION 260553

## SECTION 260923 - LIGHTING CONTROL DEVICES

### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following lighting control devices:
  - 1. Time switches.
  - 2. Photoelectric switches.
  - 3. Indoor occupancy sensors.

#### 1.3 DEFINITIONS

- A. LED: Light-emitting diode.
- B. PIR: Passive infrared.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
  - 1. Interconnection diagrams showing field-installed wiring.
- C. Operation and Maintenance Data: For each type of product to include in operation, and maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

#### 1.6 COORDINATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke

detectors, fire-suppression system, and partition assemblies. Make adjustments to device locations as necessary to coordinate with other equipment and maintain operational integrity of control system.

## 1.7 EXTRA MATERIALS

- A. Provide two each on the following indoor Lighting System Control Components:
  - 1. Motion sensor switches.

## PART 2 PRODUCTS

### 2.1 INDOOR OCCUPANCY SENSORS

- A. General Description: Solid-state units with a separate relay unit.
  - 1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 20 minutes.
  - 2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
  - 3. Relay Unit: Dry contacts rated for 20-A ballast load at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
  - 4. Mounting:
    - a. Sensor: Suitable for mounting in any position on a standard outlet box.
    - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
  - 5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
- B. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.
  - 1. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1200 sq. ft. when mounted on a 12-foot high ceiling.

### 2.2 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

## PART 3 EXECUTION

### 3.1 SENSOR INSTALLATION

- A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

### 3.2 WIRING INSTALLATION

- A. Coordinate this Article with Drawings.
- B. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- D. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

### 3.3 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."
  - 1. Identify controlled circuits in lighting contactors.
  - 2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

### 3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
  - 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
  - 2. Operational Test: Verify operation of each lighting control device, and adjust time delays.
- B. Lighting control devices that fail tests and inspections are defective work.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions.

END OF SECTION

## SECTION 262726 - WIRING DEVICES

### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
  - 2. Wall-box motion sensors.
  - 3. Snap switches.
  - 4. Communications outlets.
  - 5. Pendant cord-connector devices.
  - 6. Cord and plug sets.

#### 1.3 DEFINITIONS

- A. Retain term and abbreviations that remain after this Section has been edited.
- B. EMI: Electromagnetic interference.
- C. GFCI: Ground-fault circuit interrupter.
- D. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- E. RFI: Radio-frequency interference.
- F. TVSS: Transient voltage surge suppressor.
- G. UTP: Unshielded twisted pair.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Manufacturer's data for each type of device.
- C. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

## 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

## 1.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
  - 1. Cord and Plug Sets: Match equipment requirements.

## PART 2 PRODUCTS

### 2.1 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
  - 1. Color: To be selected by Architect.

### 2.2 GFCI RECEPTACLES

- A. General Description: Straight blade, feed through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
  - 1. Color: To be selected by Architect.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

### 2.3 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
  - 1. Color: To be selected by Architect.
  - 2. Operation: Single pole, three-way or four-way as indicated on drawings.
- C. Key-Operated Switches, 120/277 V, 20 A:
  - 1. Description: Single pole, with factory-supplied key in lieu of switch handle.

## 2.4 OCCUPANCY SENSORS

### A. Wall-Switch Sensors:

1. Description: Adaptive-technology type, 120/277 V, adjustable time delay up to 20 minutes, 180-degree field of view, with a minimum coverage area of 800 sq. ft.
  - a. Color: To be selected by Architect.

## 2.5 COMMUNICATIONS OUTLETS

### A. Telephone Outlet:

1. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.

### B. Combination TV and Telephone Outlet:

1. Description: Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e; and one Type F coaxial cable connector.

## 2.6 WALL PLATES

### A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished and Unfinished Spaces: 0.035-inch- thick, satin-finished stainless steel.

### B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### A. Comply with NECA 1, unless otherwise noted.

#### B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.

4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminate on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
5. Tighten unused terminal screws on the device.
6. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
7. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

### 3.2 FIELD QUALITY CONTROL

A. Tests for Convenience Receptacles:

1. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
2. Using the test plug, verify that the device and its outlet box are securely mounted.
3. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION



## SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

### PART 1 - GENERAL

#### 1.1 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.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Molded-case circuit breakers (MCCBs).
  - 2. Enclosures.

#### 1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
  - 1. Enclosure types and details for types other than NEMA 250, Type 1.
  - 2. Current and voltage ratings.
  - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
  - 4. Include evidence of NRTL listing for series rating of installed devices.
  - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
  - 6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.
- B. Shop Drawings: For enclosed switches and circuit breakers.

- C. Qualification Data: For qualified testing agency.

## 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
  - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.

## 1.6 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

### 2.1 MOLDED-CASE CIRCUIT BREAKERS

- A. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- B. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- C. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- D. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

### 2.2 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
  - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.

2. Outdoor Locations: NEMA 250, Type 3R.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with NECA 1.

#### 3.3 IDENTIFICATION

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
  1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  2. Label each enclosure with engraved metal or laminated-plastic nameplate.

#### 3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
  1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Acceptance Testing Preparation:
  1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
  2. Test continuity of each circuit.
- D. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- E. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION

## SECTION 265100 - INTERIOR LIGHTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Interior lighting fixtures, LED's and drivers.
  - 2. Lighting fixture supports.

#### 1.3 DEFINITIONS

- A. BF: Ballast factor.
- B. CCT: Correlated color temperature.
- C. CRI: Color-rendering index.
- D. HID: High-intensity discharge.
- E. LER: Luminaire efficacy rating.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting fixture, including ballast housing if provided.
- H. L.E.D.: Light Emitting Diode.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
  - 1. Physical description of lighting fixture including dimensions.
  - 2. Emergency lighting units including battery and charger.
  - 3. Energy-efficiency data.
  - 4. Life, output (lumens, CCT, and CRI), and energy-efficiency data for LED's.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  2. Wiring Diagrams: For power, signal, and control wiring.
- C. Installation instructions.
- D. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
- 1.5 QUALITY ASSURANCE
- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - B. Comply with NFPA 70.
- 1.6 COORDINATION
- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Metal Parts: Free of burrs and sharp corners and edges.
- C. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Diffusers and Globes:
  1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
    - a. Lens Thickness: At least 0.125 inch minimum for 2' x 2' and 2' x 4' fixtures unless otherwise indicated.
    - b. UV stabilized.

- F. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

## 2.2 LED LIGHT FIXTURES

### A. General:

1. Listing: LED fixtures shall be UL listed or UL classified, CE certified and PSA marked. LED fixture and systems shall meet RoHS (Removal of Hazardous Substances) directives. Manufacturer shall be able to provide supporting documentation testing results.
2. LED drivers shall include the following features, unless otherwise indicated:
  - a. Minimum efficiency: 85% at full load.
  - b. Minimum operating ambient temperature: -4 deg F.
  - c. Input voltage: 120 - 277V ( $\pm 10\%$ ) at 60 Hz.
  - d. Integral short circuit, open circuit, and overload protection.
  - e. Power factor:  $\geq 0.95$ .
  - f. Total harmonic distortion:  $\leq 20\%$ .
  - g. Comply with FCC 47 CFR Part 15.
3. LED modules shall include the following features, unless otherwise indicated:
  - a. Comply with IES LM-79 and LM-80 requirements.
  - b. Minimum CRI 80 and color temperature 3000° K, unless otherwise specified in Lighting Fixture Schedule.
  - c. Minimum rated life: 50,000 hours per IES L70.
  - d. Light output lumens as indicated in the Lighting Fixture Schedule.

### B. LED Downlights:

1. Housing, LED driver and LED module shall be products of the same manufacturer.

### C. Heat: Fixture housings shall be designed to transfer heat from the LED board to the outside environment.

### D. Fixtures for Wet and Damp Use: Fixtures themselves shall be sealed, rated and tested for appropriate environmental conditions, not accomplished by using an additional housing or enclosure.

### E. Connections: All hardwired connections to LED fixtures shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.

### F. Burn-In-Time: All LED fixtures (100% of each lot) shall undergo a minimum eight-hour burn-in test during manufacturing.

- G. Single Source Components: All LED fixtures and power/data supplies shall be provided by a single manufacturer to ensure compatibility. Manufacturer shall have at least three years of experience designing, selling and supporting intelligent LED systems.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

#### A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

#### B. Lay-in Ceiling Lighting Fixtures Supports:

1. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
2. Fixture Support: Provide fixture support independent of ceiling grid. Provide a minimum of 4 hanger wires for each 2' x 4' fixture, and a minimum of 2 wires for each 2' x 2' fixture.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4 inch metal channels spanning and secured to ceiling tees.
4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

#### C. Suspended Lighting Fixture Support:

1. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
2. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
3. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

#### D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### 3.2 IDENTIFICATION

- A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

### 3.3 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

### 3.4 STARTUP SERVICE

- A. Burn in all lamps that require specific aging period to operate properly, prior to occupancy by Owner. Burn-in LED fixtures intended to be dimmed, for at least 100 hours at full voltage.

### 3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.
  - 1. Adjust aimable luminaires in the presence of Architect.

END OF SECTION 265100



## SECTION 270000 – COMMUNICATIONS

### PART 1 - GENERAL

#### 1.1 FACILITY OVERVIEW

- A. The purpose of this specification is to provide the Fair Lawn BOE with a technologically advanced educational facility's new addition.

#### 1.2 SUMMARY OF WORK

- A. The scope of work specified by these documents shall result in the provision, installation and testing of the following IT Communications infrastructure, systems and equipment.

1. All Voice and Data System Wiring
2. Video/CATV Control and Distribution Systems
3. Wiring for the ceiling mounted projectors
4. Projectors and Projector Ceiling Mounts
7. Paging/Intercom System (including wiring)
8. Clock System (including wiring)
8. Audio equipment and speakers in classrooms, Gymnasium, Cafeteria and other spaces of the building
9. Security Access and Surveillance/CCTV Cameras (including wiring)
10. Intrusion Alarm/Detection System (including wiring)
11. Conduit and raceways. Cable ladders in MDF and IDFs shall be provided by Electrical Contractor
12. Cabling and Terminations for Wireless Data Communication System (Wireless Access Points, WAPs, furnished by others)

- B. Systems shall utilize digital technology to integrate the following systems into a single network linking them to a central site:

1. LAN System (Refer to Drawings IT-101 and IT-102)
  - a. For data communications, the existing Wide Area Network will be the central means of communicating throughout for Authority-wide email, network access to shared files and Internet Access.
  - b. Locally, the facility will be provided with wiring for a Local Area Network for all local voice/data and video connectivity.
  - c. Data Network Backbone shall be comprised of 50/125-micrometer, optical fiber cabling.
  - d. Voice Backbone shall be 100 Pair Category 3 UTP cable.
2. Wireless Data Communication System consisting of Category 6 horizontal cabling infrastructure.
  - a. Wireless Data Communications Network infrastructure shall be provided as per the specifications herein. Wireless Access Points (WAPs) shall be furnished by others. WAP symbols on drawings indicate termination points where WAPs are to be installed.
  - b. Topology
    - 1) The Wireless Data Communications Network specified herein will use a star Topology.

- 2) The network in which this system shall be integrated will consist of a Main Distribution Frame (MDF) and several Intermediate Distribution Frames (IDF's) connected to the MDF via two (2) 1GB EtherChannel fiber connections. The MDF contains the network servers and the network core. All IDF's will terminate horizontal workstation runs. The runs will connect to 10/100/1000 Ethernet switches (Furnished By Others) that are connected to the multi-mode fiber backbone that feeds the core switch that shall service both wired and wireless data networks.
- 3) The network backbone shall consist of gigabit Ethernet over multi-mode fiber.
- 4) The horizontal cabling to the desktop from the wiring closets shall consist of Fast Ethernet 100BASE-TX
- 5) Refer to Division 27 for detailed cabling requirements:
- c. This section includes the minimum requirements for termination hardware and cable for a Wireless Data Communication System.
- d. Quality Assurance
  - 1) All equipment shall be installed in a neat and workmanlike manner.
  - 2) All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Authority's representative.
  - 3) Materials shall be of the quality and manufacturer indicated. Only equipment and materials manufactured by major manufacturing companies are acceptable. No generic equipment or materials shall be allowed, unless otherwise approved in writing by the Design Consultant.
  - 4) Separation from sources of EMI shall be as specified in section.
  - 5) Communication grounding/earthing and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC 1000-5-2, ANSI/TIA/EIA-607, or both be observed throughout the entire cabling system.
  - 6) Materials and work specified herein shall comply with the applicable requirements of:
    - a) EIA/TIA-568-A.
    - b) EIA/TIA-569-A
    - c) EIA/TIA-606
    - d) EIA/TIA-607
    - e) Underwriters Laboratory
    - f) FCC (including CFR 47 and Part 68 - subpart F)
    - g) National Electric Code
    - h) Local and State Codes
    - i) ISO/IEC 11801
    - j) IEC 1000-5-2
    - k) CSA C22.2
    - l) IEC 60603-7
3. Video Control and Distribution System
  - a. Each designated room in the school will have a CATV outlet connected via the data network to the MDF/IDF, one (1) speaker that is connected to the amplifier serving the ceiling mounted projector outlet, and paging speakers that will be operated through the paging system.
  - b. The CATV / video system will allow teacher initiated playing of instructional DVDs and CDs as well as provide the capability to originate a video



B. The following is a list of codes and standards that will apply to this project:

1. New Jersey Uniform Fire Prevention and Building Code.
2. New Jersey Department of Labor Rules and Regulations.
3. New Jersey Department of Health.
4. Federal Occupational Safety and Health Administration - OSHA.
5. National Life Safety Code, NFPA 101.
6. National Electrical Code (NEC), NFPA 70
7. Underwriters Laboratory (UL).
8. ANSI/TIA/EIA - Telecommunications Building Wiring Standards (Most current addition, revision and addenda), including, but limited to, the following compilation series of documents: 568, 570, 598, 606, 607, 758, TSB 67, TSB 72, TSB 75, FIP 174, FIP175, FIP176,
9. BICSI Telecommunications Distribution Methods Manual, Telecommunications Cabling Installation Manual, Customer-Owned Outside Plant Manual, LAN and Internetworking Design Manual.
10. IEEE Standards.
11. IEEE-SA - National Electrical Safety Code (NESC)
12. Federal Communications Commission.
13. NEMA – National Electrical Manufacturers' Association
14. CSA – Canadian Standards Association
15. ADA, Americans with Disabilities Act.

#### 1.4 GLOSSARY

- A. ANSI: American National Standards Institute
- B. ASME: American Society of Mechanical Engineers
- C. ASTM: American Society for Testing Materials
- D. BICSI: Building Industry Consulting Services International
- E. CSA: Canadian Standards Association
- F. EIA: Electronic Industries Association
- G, FCC: Federal Communications Commission
- H. FM: Factory Mutual Insurance Company
- I. IEEE: Institute of Electrical and Electronics Engineers
- J. IRI: Industrial Risk Insurers
- K. ISO: International Standards Organization
- L. NEC: National Electrical Code
- M. NEMA: National Electrical Manufacturers' Association
- N. NESC: National Electrical Safety Code

- O. NFPA: National Fire Protection Association
- P. New Jersey BFU: New Jersey Board of Fire Underwriters
- Q. New Jersey /DEC: New Jersey Department of Environmental Conservation
- R. New Jersey /UFBC: New Jersey Uniform Fire Prevention and Building Code
- S. OSHA: Occupational Safety and Health Administration
- T. TIA: Telecommunications Industry Association
- U. UFPO: Underground Facilities Protective Organization
- V. UL: Underwriter's Laboratories, Inc.

#### 1.5 DEFINITIONS

- A. Approved / Approval: Written permission to use a material or system.
- B. As Called For: Materials, equipment including the execution specified/shown in the contract documents.
- C. Code Requirements: Minimum requirements.
- D. Concealed: Work installed in pipe and duct shafts, chases or recesses, inside walls, above ceilings, in slabs or below grade.
- E. Design Equipment: Refer to the article, BASIS OF DESIGN.
- F. Design Make: Refer to the Article, BASIS OF DESIGN.
- G. Equal or Equivalent: Equally acceptable as determined by Design Consultant.
- H. Exposed: Work not identified as concealed.
- I. Final Acceptance: The Authority's acceptance of the project from Contractor upon certified by the Authority's Representative.
- J. Furnish: Supply and deliver to installation location.
- K. Furnished by Others: Receive delivery at job site or where called for and installed.
- L. Inspection: Visual observations by the Authority's site Representative.
- M. Install: Mount and connect equipment and associated materials ready for use.
- N. Labeled: Refers to classification by a standards agency.

- O. Make: Refer to the article, BASIS OF DESIGN.
- P. Or Approved Equal: Approved equal or equivalent as determined by Design Consultant.
- Q. Authority's Representative: The Prime Professional
- R. Prime Professional: Design Consultant having a contract directly with the Authority for professional services.
- S. Provide: Furnish, install and connect ready for use.
- T. Relocate: Disassemble, disconnect, and transport equipment to new locations, then clean, test, and install ready for use.
- U. Replace: Remove and provide new item.
- V. Review: A general contractual conformance check of specified products.
- W. Roughing: Pipe, duct, conduit, cabling, equipment layout and installation.
- X. Satisfactory: As specified in contract documents.
- Y. Site Representative: Construction Manager at the work site.
- Z. Refer to General Conditions of the Contract for additional definitions.

#### 1.6 INTENT OF DRAWINGS

- A. The drawings are diagrammatic, unless detailed dimensioned drawings are included. Drawings show approximate locations of equipment, and fixtures. Exact locations are subject to the approval of the Authority's Representative.
- B. The Contractor should verify all dimensions locating the work and its relation to existing work, all existing conditions and their relation to the work and all man made obstructions and conditions, etc. affecting the completion and proper execution of the work as indicated in the Contract Documents.

### PART 2 – PRODUCTS

#### 2.1 Equipment and Materials Minimum requirements:

- A. Materials requirements:
  - 1. All equipment and material for which there is a listing service shall bear a UL label.
  - 2. Electrical equipment and systems shall meet UL Standards and requirements of the NEC and CSA. This listing requirement applies to the entire assembly. Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with these requirements.
  - 3. Equipment shall meet all applicable FCC Regulations
  - 4. All materials, unless otherwise specified, shall be new and be the standard products of the manufacturer. Used equipment or damaged material will be rejected.

5. The listing of a manufacturer as “acceptable” does not indicate acceptance of a standard or catalogued item of equipment. All equipment and systems must conform to the Specifications and meet the quality of the design make.
6. Where applicable, all materials and equipment shall bear the label and listing of Underwriters Laboratory of Factory Mutual. Application and installation of all equipment and materials shall be in accordance with such labeling and listing.

B. Proprietary Specifications:

1. The following product/manufacturer has been approved by the Authority for proprietary specifications and use in this project.
  - a. Wireless Access Points: Meru
2. Subject to compliance with codes and all project requirements, the Contractor is required to use the indicated product/manufacturer and to verify compatibility with the project School District’s existing systems.

C. Proprietary Specifications:

1. The following product/manufacturer has been approved by the Authority for proprietary specifications and use in this project.
  - a. Call Manager: Cisco Unity
2. Subject to compliance with codes and all project requirements, the Contractor is required to use the indicated product/manufacturer and to verify compatibility with the project School District’s existing systems.

D. Proprietary Specifications:

1. The following product/manufacturer has been approved by the Authority for proprietary specifications and use in this project.
  - a. WAN and Internet Service: Cablevision
2. Subject to compliance with codes and all project requirements, the Contractor is required to use the indicated product/manufacturer and to verify compatibility with the project School District’s existing systems.

## 2.2 CABLES

- A. Any cable associated with this Contract, passing through two or more floors shall be suitable, listed and marked for use in a riser or plenum application. Riser cable shall minimally be CMR or OFNR rated per the National Electrical Code and shall meet all local and state codes.
- B. Any cable associated with this Contract shall be rated, listed and marked for use in a plenum application, regardless if the ceiling is a ducted return air plenum or not. Cable shall meet all local and state codes.
- C. Voice copper backbone cables, if required, shall be twisted 24 AWG, contain a corrugated aluminum shield, be of the size indicated on the drawings and have the proper jacket classification per the NEC.
- D. All copper underground feeder cable associated with this Contract, if required, shall be suitable, listed and marked for use in a duct application per the National Electrical Code article 800 and shall meet all local codes. Copper underground cables shall be jell-filled, twisted 24 AWG., contain a overall corrugated shield, be of the size indicated on the drawings, shall have footage indicators imprinted on the cable jacket and shall meet REA/RUS specification PE-39 or PE-89.

## 2.3 FACTORY ASSEMBLED PRODUCTS

- A. Provide maximum standardization of components to reduce spare part requirements.
- B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
  - 1. All components of an assembled unit need not be products of same manufacturer.
  - 2. Constituent parts, which are alike, shall be product of a single manufacturer.
  - 3. Components shall be compatible with each other and with the total assembly for intended service.
- C. Components of equipment shall bear manufacturer's name or trademark, model number and serial number on a nameplate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.
- D. Major items of equipment that serve the same function must be the same make and model. Exception will be permitted if performance requirements cannot be met.

## 2.4 COMPATABILITY OF RELATED EQUIPMENT

- A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that a complete and fully operational system will result.
- B. Provide maximum standardization of components to reduce spare part requirements.
- C. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
  - 1. All components of an assembled unit need not be products of same manufacturer.
  - 2. Constituent parts that are alike shall be product of a single manufacturer.
  - 3. Components of equipment shall bear manufacturer's name or trademark, model number and serial number on a nameplate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.

## 2.5 LIFTING ATTACHMENTS

- A. Equipment should have suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered without bending or distortion of shape, such as rapid lowering and braking of load.

## 2.6 MISCELLANEOUS SUPPORTS

- A. Metal bars, plates, tubing, etc. shall conform to the following ASTM standards:
  - 1. Steel plates, shapes, bars, and grating - ASTM A 36
  - 2. Cold-Formed Steel Tubing - ASTM A 500
  - 3. Hot - Rolled Steel Tubing - ASTM A 500
  - 4. Steel Pipe - ASTM A 53, Schedule 40, welded

- B. Metal Fasteners shall be Zinc-coated (type, grade and class as required)

## 2.7 FIRESTOPPING

- A. Firestopping for Openings through Fire and Smoke Rated Walls and Floor Assemblies shall be listed or classified by an approved independent testing laboratory for "Through-Penetration Firestop Systems." The system shall meet the requirements of "Fire Tests of Through-Penetration Firestops" designated ASTM E814.
- B. Inside of all conduits, the firestop system shall consist of a dielectric, water resistant, non-hardening, permanently pliable/re-enterable putty along with the appropriate damming or backer materials (where required). The sealant must be capable of being removed and reinstalled and must adhere to all penetrants and common construction materials and shall be capable of allowing normal wire/cable movement without being displaced.
- C. All conduit and sleeve openings shall be waterproofed or fireproofed in compliance with New Jersey Building and Fire Codes. Strict adherence to National and State Fire Codes, particularly firestopping will be required.
- D. All openings remaining around and inside all conduit, sleeves and cable penetrations to maintain the integrity of any fire rated wall, ceiling, floor, etc. shall be patched.
- E. All building conduits and sleeves installed and/or used under this contract shall be firestopped or re-firestopped upon cable placement through such passageways.
- F. Manufacturer's recommended installation standards must be closely followed (i.e. minimum depth of material, use of ceramic fiber and installation procedures).
- G. Provide firestop system seals at all locations where conduit, fiber, cable trays, cables/wires, and similar utilities pass through or penetrate fire rated wall or floor assembly. Provide firestop seal between sleeve and wall for drywall construction.
- H. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the firestop system. The installation shall provide an air and watertight seal.
- I. The methods used shall incorporate qualities that permit the easy removal or addition of conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating. Typical rating:
  - 1. Floors - 3 hours
  - 2. Corridor walls - 2 hours
  - 3. Offices -  $\frac{3}{4}$  hour
  - 4. Smoke partitions -  $\frac{3}{4}$  - 1 hour
- J. Provide firestop pillows for existing cable tray penetrations through firewalls.

## PART 3 - EXECUTION

### 3.1 ROUGH-IN

- A. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc. Verify final locations for installation with field measurements and with the equipment being connected. Verify exact location and elevations at work site prior to any rough in work. If field conditions, details, changes in equipment or shop drawing information require a significant change to the original documents, contact the Authority's representative for approval before proceeding.
- B. All equipment locations shall be coordinated with other trades, other renovation projects, and existing conditions to eliminate interference with required clearances for equipment maintenance and inspection.
  - 1. Coordinate work with other trades, other renovation projects, and existing conditions to determine exact routing of all cable tray, hangers, conduit, etc., before fabrication and installation. Coordinate with Technology Drawings. Verify with the Authority's Representative exact location and mounting height of all equipment in finished areas, such as equipment racks, communication and electrical devices. Coordinate all work with existing architecture.
  - 2. Where more than one trade is involved in an area, space or chase, all shall cooperate and install their own work to utilize the space equally between them in proportion to their individual requirements. There will be no priority schedule for trades. If, after installation of any equipment, piping, ducts, conduit, and boxes, it is determined that ample maintenance and passage space has not been provided, rearrange work and/or furnish other equipment as required for ample maintenance space. Any changes in the size or location of the material or equipment supplied or proposed, which may be necessary in order to meet field conditions or in order to avoid conflicts between trades, shall be brought to the immediate attention of the Authority's Representative and approval received before such alterations are made.
- C. Provide easy, safe, and code mandated clearances at equipment racks and enclosures, and other equipment requiring maintenance and operation.

### 3.2 CUTTING AND PATCHING

- A. Cut and drill from both sides of walls and/or floors to eliminate splaying. Patch adjacent existing work disturbed by installation of new work including insulation, walls and wall covering, ceiling and floor covering, other finished surfaces. Patch and/or paint openings and damaged areas equal to existing surface finish. Cut openings in prefabricated construction units in accordance with manufacturer's instructions.

### 3.3 CONCEALMENT

- A. Use existing conduit and surface raceway where possible and practicable. Conceal all contract work above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify the Authority's Representative before starting that part of the work and install only after his review. In areas with no ceilings, install only after the Authority's Representative reviews and comments on arrangement and appearance.

### 3.4 CHASES

#### A. General

1. Field verifies for correct size and location for all openings, recesses and chase.
2. Assume responsibility for correct and final location and size of such openings.
3. Rectify improperly sized, improperly located or omitted chases or openings due to faulty or late information or failure to check final location.
4. Correct, by drilling, omitted or improperly located sleeves. Assume responsibility for all work and equipment damaged during course of drilling. Cap or firestop all unused conduits and sleeves.
5. Provide angle iron frame where openings are required for contract work.
6. Seal voids in fire rated assemblies with a firestopping seal system to maintain the fire resistance of the assembly. Provide 18 gauge-galvanized sleeves at fire rated assemblies. Extend sleeves 2" above floors.
7. In wall openings, drill or cut holes to suit. Provide 18 gauge galvanized sleeves at shafts and fire rated assemblies. Provide firestopping seal between sleeves and wall in drywall construction. Provide firestopping similar to that for floor openings.

### 3.5 WATERPROOFING

- A. The Contractor shall seal all foundation penetrating conduits and all service entrance conduits and sleeves to eliminate the intrusion of moisture and gases into the building. This requirement also includes spare conduits.
- B. Spare conduits shall be plugged with expandable plugs.
- C. All service entrance conduits through building shall be sealed or resealed upon cable placement.
- D. Conduits with cables in them shall be permanently sealed by firmly packing the void around the cable with oakum and capping with a hydraulic cement or waterproof duct seal.

### 3.6 SUPPORTS

- A. Provide required supports, beams, angles, hangers, rods, bases, braces, straps, struts, and other items to properly support contract work. Supports shall meet the approval of the the Authority's Representative. Modify studs, add studs, add framing, or otherwise reinforce studs in metal stud walls and partitions as required to suit contract work. If necessary, in stud walls, provide special supports from floor to structure above. For precast Panels/Planks and Metal Decks, support communication work as determined by manufacturer and the Authority's Representative. Provide heavy gauge steel mounting plates for mounting contract work. Mounting plates shall span two or more studs. Size, gauge, and strength of mounting plates shall be sufficient for equipment size, weight, and desired rigidity.

### 3.7 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate ordering and installation of all equipment with long lead times or having a major impact on work by other trades so as not to delay the job or impact the schedule.
- B. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible.

- C. Set all equipment to accurate line and grade, level all equipment and align all equipment components.
- D. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from premises when no longer required.
- E. No equipment shall be hidden or covered up prior to inspection by the Authority's representative. All work that is determined to be unsatisfactory shall be corrected immediately.
- F. All work shall be installed level and plumb, parallel and perpendicular to other building systems and components.

### 3.8 IMPLEMENTATION

- A. The contractor shall provide and install all hardware, software, connections and appurtenances required for fully operational systems.

END OF SECTION 270000

## SECTION 270500 – COMMON WORK RESULTS FOR COMMUNICATIONS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Sleeves for pathways and cables.
  - 2. Sleeve seals.
  - 3. Grout.
  - 4. Common communications installation requirements.

#### 1.2 SUBMITTALS

- A. Product Data: For sleeve seals.
- B. Warranty: Provide manufacturer's system warranty against electrical or mechanical defects for 2 years from date of final acceptance.

### PART 2 - PRODUCTS

#### 2.1 TELE-POWER POLES

- A. Acceptable Manufacturers:
  - 1. Mono-Systems, Inc.
  - 2. Panduit Corp.
  - 3. Wiremold/Legrand
  - 4. Or approved equal
- B. Material: Aluminum with clear anodized finish.
- C. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

#### 2.2 SLEEVES FOR PATHWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
  - 1. Minimum Metal Thickness:
    - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).

- b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

## 2.3 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
  - 1. Acceptable Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
    - e. Or approved equal
  - 2. Sealing Elements: Interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.
  - 3. Pressure Plates: Include two for each sealing element.
  - 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## 2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

## PART 3 - EXECUTION

### 3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

### 3.2 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

- A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Utilize 4" sleeves to provide clear space between sleeve and pathway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
  - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 7.
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Division 7.
- K. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

### 3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

### 3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7.

END OF SECTION 270500



## SECTION 270526 – GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

### PART 1 – GENERAL

#### 1.1 WORK INCLUDED

- A. Provide all labor, materials, tools, installation equipment, and test equipment required for the complete installation of grounding and bonding for telecommunications systems within the structure.

#### 1.2 REFERENCES

- A. ANSI-J-STD-607-A-2002 – Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
- B. National Fire Protection Association (NFPA – 70), National Electrical Code (NEC)
- C. ANSI T1.333-2001 – Grounding and Bonding of Telecommunications Equipment

#### 1.3 QUALITY ASSURANCE

- A. The materials and their installation shall conform to the requirements of ANSI-J-STD-607-A-2002 and the National Electrical Code
- B. Use adequate numbers of skilled work-persons thoroughly trained and experienced on the necessary crafts and completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.

### PART 2 – PRODUCTS

#### 2.1 STANDARD

- A. All materials used in the installation shall be new and shall comply in weight, size and composition as required by manufacturer and shall be labeled or listed by Underwriters Laboratories Inc. for use in electrical grounding.

#### 2.2 ACCEPTABLE MANUFACTURES

- 1. Harger Lightning & Grounding
- 2. Or Approved Equal

#### 2.3 TELECOMMUNICATIONS MAIN GROUNDING BUSBAR (TMGB)

- A. The TMGB shall be ¼”T x 4”W x 12”L copper ground bar.
  - 1. The TMGB shall be predrilled with holes for use with standard sized lugs.
  - 2. The TMGB shall be UL listed and meet the requirements of ANSI-J-STD-607-A-2002
  - 3. The TMGB shall be sized as above or lengthened to meet requirements of the immediate application with consideration for future growth.

## 2.4 TELECOMMUNICATIONS GROUNDING BUSBAR (TGB)

- A. The TGB shall be a ¼”T x 2”W x 12”L copper ground bar.
  - 1. The TMGB shall be predrilled with holes for use with standard sized lugs.
  - 2. The TMGB shall be UL listed and meet the requirements of ANSI-J-STD-607-A-2002.
  - 3. The TMGB shall be sized as above or lengthened to meet requirements of the immediate application with consideration for future growth.

## 2.5 CONDUCTORS

- A. Conductors shall be stranded copper conductors with green insulation
  - 1. Minimum conductor size No. 6 AWG.
  - 2. Conductors shall be sized at 2 kcmil per linear foot of conductor length. For example: A conductor 25 feet in length shall be No. 2 AWG (66,360 cmil). A conductor 100 feet in length shall be No. 4/0 AWG (211,600 cmil)
  - 3. Insulation shall be rated for the environment where it is installed.

## 2.6 CONNECTOR LUGS

- A. Lugs for connecting to the TMGB and TGB shall be UL Listed two-hole, long barrel, electro tin-plated compression lugs with inspection port.
  - 1. Antioxidant joint compound shall be applied to the contact areas.
  - 2. Lugs shall be secured to the ground bars with ¼” minimum stainless steel hex head cap screws with stainless steel washers, lock washers and nuts.

## 2.7 EXOTHERMIC WELDED CONNECTIONS

- A. Exothermic Welded connections shall be.
  - 1. Weld types BE shall be made to the ground bars using appropriate size weld metal.
  - 2. Weld types VA, VD, or VU shall be made to structural steel framework

## PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. The telecommunications main grounding bar (TMGB) is a dedicated extension of the building grounding electrode system for the telecommunications system. The TMGB should be located near the telecommunications service entrance and the electric service entrance.
  - 1. The TMGB shall be connected to the main electric service entrance panel ground or the branch electric panel ground that serves the telecommunications equipment.
  - 2. The TMGB shall be located to minimize the length of the bonding conductor for telecommunications from the TMGB to the electric service ground.
  - 3. The bonding conductor for telecommunications shall be at least the same size as the telecommunications backbone (TBB) conductor.
  - 4. The TMGB shall serve telecommunications equipment that is located in the same room or space.

5. Connections to the TMGB shall be made by exothermic welding or by listed two-hole compression lugs.
  6. All metal conduits or raceways for telecommunications cabling located within the same room or space as the TMGB shall be bonded to the TMGB.
    - a. Metal conduits 1" diameter and larger shall be bonded using electro tin-plated pipe clamps.
    - b. Metal conduits less than 1" diameter shall be bonded using electro tin-plated conduit bonding clamps.
    - c. Metal cable trays shall be bonded using electro tin-plated cable tray bonding clamps.
    - d. Bonding surface areas shall be cleaned to bare metal removing all paint, etc. The contact area shall be protected from corrosion using antioxidant joint compound.
  7. Where an electric power panel for telecommunications equipment is located in the same room or space as the TMGB, the panel ground bus or panel enclosure shall be bonded to the TMGB.
  8. The TMGB shall be located in an area that is accessible to telecommunications personnel
- B. The telecommunications backbone (TBB) is a conductor that originates at the TMGB and extends throughout the building interconnecting all telecommunications grounding busbars (TGBs) with the TMGB.
1. The TBB shall be a copper conductor. The minimum size of the conductor shall be No. 6 AWG. The size of the conductor shall be increased 2 kcmil per linear foot as the length of the TBB increases. For example: A TBB 25 feet in length shall be No. 2 AWG (66,360 cmil). A TBB 100 feet in length shall be No. 4/0 AWG (211,600 cmil)
  2. The TBB conductors should be installed without splices. Where splices are necessary, the number of splices should be minimized and located in accessible telecommunications spaces. Splices shall be made using exothermic welding, listed irreversible compression connectors or equivalent.
  3. The building water piping system shall not be used as a TBB.
  4. Metallic cable shields or metallic conduits shall not be used as a TBB.
- C. A telecommunications grounding busbar (TGB) shall be provided in each area where telecommunications equipment is located. The TGB is the grounding connection point for telecommunications systems and equipment in each separate area.
1. The TGBs shall be connected to the TMGB via the TBB conductor.
  2. The TBB and other TGBs within the same area shall be bonded to the TGB with a conductor the same size as the TBB.
  3. The bonding conductor between the TBB and the TGB shall be continuous and routed in the shortest straight-line path possible.
  4. Connections to the TGB shall be made by exothermic welding or by listed two-hole compression lugs.
  5. All metal conduits or raceways for telecommunications cabling located within the same room or space as the TGB shall be bonded to the TGB.
  6. Where an electric power panel for telecommunications equipment is located in the same room or space as the TGB, the panel ground bus or panel enclosure shall be bonded to the TGB.

- D. Where there are multiple telecommunications rooms or spaces with multiple TBBs, the TBBs shall be interconnected with a Grounding Equalizer (GE) conductor at the TGBs.
1. Welding.
  2. In structural steel frame buildings, where the steel framework is accessible The GE shall be sized as specified for the TBB.
- E. Connections of the GE to the TGBs shall be made by exothermic within the room; the TMGB and each TGB shall be bonded to the structural steel frame using a minimum No. 6 AWG conductor.
1. Connections to the structural steel frame shall be made by exothermic welding. The area of contact on the steel frame shall be cleaned to bare metal removing all paint and mill scale. The contact area shall be protected from corrosion using antioxidant joint compound.
  2. Where the structural steel frame is external to the room and is accessible, the structural steel should be bonded to the TGB or the TMGB using a minimum No. 6 AWG conductor.

END OF SECTION 270526

## SECTION 270528 – PATHWAYS FOR COMMUNICATIONS SYSTEMS

### PART 1 - GENERAL

#### 1.1 SCOPE OF SPECIFICATION

- A. This section includes the minimum requirements for the following: EMT conduit J-Hooks Threaded Rod Cover Stackable Cable Rack Spacers Cable Management Wireless Access Boxes Fire Stopping Materials Floor Boxes.

#### 1.2 SUBMITTALS

- A. As-Built Drawings

#### 1.3 QUALITY ASSURANCE

- A. All installation work for the interior telecommunications pathways shall be performed in a neat and workmanlike manner.
- B. Equipment and materials shall be of the quality and manufactures indicated. The equipment specified is based on the acceptable manufacturers listed. Where “approved equal” is stated, equipment shall be equivalent in every way to that of the equipment specified.
- C. Materials and work specified herein shall comply with the applicable requirements of:
  - 1. ANSI/NFPA 70 – National Electrical Code including; but not limited to, the following articles:
    - a. 250 – Grounding
    - b. 300 – Wiring Methods
    - c. 314 – Outlet, Device, Pull, and Junction Boxes; Conduit Bodies; Fittings; and Manholes
    - d. 358 – Electrical Metallic Tubing: Type EMT
    - e. 386 – Surface Metal Raceways
    - f. 770 – Optical Fiber Cables and Raceways
  - 2. ANSI/TIA/EIA-568-B.1 – Commercial Building Telecommunications Cabling Standard – Part 1: General Requirements, including applicable addendum
  - 3. ANSI/TIA/EIA-569-A – Commercial Building Standard for Telecommunications Pathways and Spaces, including applicable addendum
  - 4. ANSI/TIA/EA-606 – Administration Standard for Telecommunications Infrastructure of Commercial Buildings
  - 5. ANSI/TIA/EIA-607 – Commercial Building Grounding and Bonding Requirements for Telecommunications
  - 6. BICSI Telecommunications Distribution Methods Manual

#### 1.4 FUNCTIONAL SYSTEM DESCRIPTION

- A Refer to scaled Technology (T) drawings for lengths of cable runs.

### PART 2 - PRODUCTS

#### 2.1 EMT CONDUIT AND OUTLET BOXES

- A. Electrical Metallic Tubing (EMT)
  - 1. Electro-galvanized steel tubing 1 1/4" and larger diameter per project requirements: Conduit joint couplings and connectors: steel double set screw indenter fittings, metal bushings for 1 1/4" conduit, insulated metallic bushings for 1-1/4" and larger conduit, insulated metallic bushings with grounding lugs as required.
  - 2. Conduit sweeps: minimum 10 times the conduit inside diameter.
  - 3. Include required conduit straps, and hangers, heavy-duty malleable iron or steel, perforated pipe strap, j-hooks, bridle rings, or wire hangers are not permitted.
  - 4. LB fittings and plastic fittings are not permitted
  - 5. Nipple runs from one outlet box to another outlet box are not permitted.
- B. Outlet boxes: Galvanized steel sheet metal 2" x 4" x 2-1/8" deep minimum with single gang mud ring, except for Teacher's Jack.
  - 1. Teacher's Outlet boxes: This requires one (1) 4" x 4" gang boxes at each Teacher's Outlet location.
- C. Pull-boxes: Minimum 14 gauge galvanized steel with screw fastened cover and trim for flush or surface mounting as required for the project. Dimensions as required for the project.
- D. Metal Flex Conduit (1 1/4") and deep Cut-In Boxes where required.
- E. Pull-rope: Polypropylene monofilament line with a minimum pull tensile strength of 200 pounds.
- F. Labels for conduit and pull-boxes: 1" x 2" yellow background with 3/8" lettering to read "TELECOM"

## 2.2 NON-CONTINUOUS CABLE SUPPORT (J-HOOKS) SYSTEMS

- A. Construction:
  - 1. Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables; cULus Listed.
  - 2. Non-continuous cable supports shall have flared edges to prevent damage while installing cables.
  - 3. Non-continuous cable supports sized 1 5/16" and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces.
  - 4. Non-continuous cable supports shall have an electro-galvanized or G60 finish and shall be rated for indoor use in non-corrosive environments.
  - 5. Stainless steel non-continuous cable supports are intended for indoor and outdoor use in non-corrosive environments or where only mildly corrosive conditions apply.
- B. Multi-Tiered Non-Continuous Cable Supports Assemblies:
  - 1. Multi-tiered non-continuous cable support assemblies shall be used where separate cabling compartments are required. Assemblies may be factory assembled or assembled from pre-packaged kits.
  - 2. Assemblies shall consist of a steel angled hanger bracket holding up to six non-continuous cable supports, rated for indoor use in non-corrosive environments; cULus Listed.
  - 3. If required, the multi-tier support bracket may be assembled to manufacturer

recommended specialty fasteners including beam clamps, flange clips, C and Z purlin clips.

- C. Non-Continuous Cable Support Assemblies from Beam, Flange:
  - 1. Fastener to C to Z purlin with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments; cULus Listed.
- D. Non-Continuous Cable Support Assemblies from C & Z Purlin:
  - 1. Fastener to C to Z purlin with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments, cULus Listed.
- E. Non-Continuous Cable Support Assemblies from Wall, Concrete, or Joist
  - 1. Fastener to wall, concrete, or joist with one non-continuous cable support, factory or jobsite assembled, rated for indoor use in non-corrosive environments, cULus Listed.
- F. Non-Continuous Cable Support Assemblies from Threaded Rod:
  - 1. Fastener to threaded rod with one non-continuous cable support, factory or jobsite assembled, rated for indoor use in non-corrosive environments, cULus Listed.
  - 2. The multi-tiered support bracket shall have a static load limit of 300 lbs.
- G. Installation Accessories for Non-Continuous Cable Supports
  - 1. Non-continuous cable supports may be used as an installation tool when a removable pulley assembly is included.
  - 2. The pulley shall be made of plastic and be without sharp edges.
  - 3. The pin and bail assembly must be able to be secured to the J-Hook during cable installation.
  - 4. The pulley must remain secured while cables are being pulled.
  - 5. The pin and roller assembly must be removed after cables are installed.

## 2.3 WIRELESS ACCESS BOXES

- A. Wall-mounted enclosure for Wireless Access Equipment-Gymnasium
  - 1. Vented Steel enclosure 11" x 8" x 3"
  - 2. Finish matching wall plates
  - 3. Continuous hinge swing door with keyed lock
  - 4. Knockouts for cable entry/exit
  - 5. Two 1" antenna openings 5" apart on top of enclosure
  - 6. Include components and compatible fittings from the manufacturer as required for a complete installation
- B. Ceiling Enclosure for Wireless Access Equipment – classrooms and hallways
  - 1. Plenum-rated enclosure
  - 2. Mounts in standard 2' x 2' or 2' x 4' ceiling tile
  - 3. Continuous hinge swing down door with keyed lock
  - 4. Cable entry/exit opening with approved fire-rating foam kits
  - 5. Two 1" antenna openings 5" apart on bottom of enclosure
  - 6. Include components and compatible fittings from the manufacturer as required for a

complete installation.

## 2.4 FLOOR BOXES

### A. Acceptable Manufacturers:

1. Legrand
2. Wiremold
3. Or Approved Equal

### B. Floor Boxes

1. Classification and Use: Floor boxes shall have been examined and tested by Underwriters Laboratories Inc. to meet UL514A and/or UL514C and Canadian Standard C22.2, No. 18.1-04 and 18.2-06 and bear the U.S. and Canadian UL Listing Mark. Floor boxes shall also have been tested by Underwriters Laboratories Inc. and classified for fire resistance and bear the U.S. and Canadian UL Classification Mark. Devices shall be classified for use in 2-hour rated, unprotected reinforced concrete floors and 2-hour rated floors employing unprotected steel floor units and concrete toppings (D900 Series Designs) or concrete floors with suspended ceilings (fire resistive designs with suspended ceilings should have provisions for accessibility in the ceiling below the floor boxes). Floor boxes shall also conform to the standards set in Section 300-21 of the National Electrical Code. Floor boxes shall meet UL scrub water requirements, but are not suitable for wet or damp locations, or other areas subject to saturation with water or other liquids such as commercial kitchens. Floor boxes shall also have been evaluated by UL to meet the applicable U.S. and Canadian safety standards for scrub water exclusion when used on tile, bare concrete, terrazzo, wood, and carpet covered floors. Floor boxes shall be suitable for use in air handling spaces in accordance with Section 300-22 (C) of the National Electrical Code.
2. Floor Boxes, General: Evolution Series Floor Boxes for use on above grade concrete floors, raised floors or wood floors. Provide boxes with a component to permit installation in polished concrete or terrazzo floors. Boxes shall be compatible with complete line of workstation connectivity outlets and modular inserts.
  - a. Floor boxes provide the interface between power, communication and audio/video (A/V) cabling in above-grade floors, on-grade concrete floors, raised floors, wood floors, and fire-classified floors and the workstation or activation location where power and communication and/or A/V device outlets are required. Boxes shall provide recessed device outlets that will not obstruct the floor area. Refer to Drawings for size and types.
  - b. Floor boxes shall permit all wiring to be completed at floor level. The FC models shall be used as defined by the UL Fire Resistance Directory at a minimum spacing of two (2) ft [610mm] on center.

### C. The following model floor boxes shall be used according to the appropriate connector density and architectural application.

1. Model EFB6S Floor Boxes: Manufactured from stamped steel approved for use on above grade concrete floors, raised floors and wood floors with the same product. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall have a polyester based backed enamel finished interior (white). Boxes shall be 15-3/16" L x 13-7/8" W x 4-3/16" H [385mm x 351mm x 107mm]. Provide boxes with provisions that enable

installation into concrete floors, raised floors, or wood floors without having to purchase additional components or accessories. Provide boxes with six (6) independent wiring compartments that allow for up to six (6) receptacles, communication and/or audio/video services. Boxes shall have removable and relocatable dividers to permit custom configuration of compartments as well as permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the four (4) outer compartments shall have a minimum wiring capacity of 32-in<sup>3</sup> [524ml]. Each of the two (2) center compartments shall have a minimum wiring capacity of 38.5-in<sup>3</sup> [630ml]. Each of the six (6) compartments shall have a minimum depth of 3-7/8" [98mm] behind the plate. Provide boxes with removable compartments to facilitate installation and moves, additions, and changes. The compartments shall be removable from the top and back of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. Provide boxes with removable knockout plates to allow for the maximum cable pass-through area. The cable pass-through area shall be a minimum of 6-15/16 in<sup>2</sup> [176mm<sup>2</sup>]. The box shall contain the following number of knockouts: 10 1" trade size, six (6) 1-1/4" trade size, six (6) 3/4" trade size, and two (2) 2" trade size. Boxes shall be able to accept up to (6) six 2" trade size conduit feeds in the sides of the boxes, through the use of the EFB6S-2HUB and maintain a 4-inch deep concrete pour. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. Equip boxes with toggle clamps to allow box to be secured to raised and wood floors. The box shall be able to accept 2-3/4" x 4-1/2" standard size wall plates. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles, workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.

2. Model EFB6S-OG Floor Boxes: Manufactured from stamped steel approved for use in above grade and on-grade floor applications. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall be painted with a fusion-bonded epoxy designed for use on metal reinforcement bar and related accessories before encapsulation in concrete, and be approved for use on-grade and above grade floors. Boxes shall be 15-3/16" L x 13-7/8" W x 4-3/16" H [385mm x 351mm x 107mm]. Provide boxes with six (6) independent wiring compartments that allow for up to six (6) duplex receptacles, communication and/or audio/video services. Boxes shall have removable and relocatable dividers to permit custom configuration of compartments as well as permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the four (4) outer compartments shall have a minimum wiring capacity of 32-in<sup>3</sup> [524ml]. Each of the two (2) center compartments shall have a minimum wiring capacity of 38.5-in<sup>3</sup> [630ml]. Each of the six (6) compartments shall have a minimum depth of 3-7/8" [98mm] behind the plate.

Provide boxes with removable compartments to facilitate installation. The compartments shall be removable from the top of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. The box shall contain the following number of knockouts: 10 1" trade size, six (6) 1-1/4" trade size, six (6) 3/4" trade size, and two (2) 2" trade size. Boxes shall be able to accept up to (6) six 2" trade size conduit feeds in the sides of the boxes, through the use of the EFB6S-2HUB and maintain a 4-inch deep concrete pour. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. The box shall be able to accept 2-3/4" x 4-1/2" standard size wall plates. Include mounting brackets with the boxes that will accommodate 15 amp,

20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles, workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.

3. Model EFB6S-FC Floor Boxes: Manufactured from stamped steel approved for use in 2-hour fire-rated concrete floors. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall have a polyester based backed enamel finished interior (white). Boxes shall be 15-3/16" L x 13-7/8" W x 4-3/16" H [385mm x 351mm x 107mm]. Provide boxes with a 21-3/4" L x 17-1/4" W x 6-1/2" H [552mm x 438mm x 165mm] sheet metal concrete pan to ensure that 3-1/4 inches [83mm] of concrete surrounds the box. Provide boxes with six (6) independent wiring compartments that allow for up to six (6) receptacles, communication and/or audio/video services.

Boxes shall permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the four (4) outer compartments shall have a minimum wiring capacity of 32-in<sup>3</sup> [524ml]. Each of the two (2) center compartments shall have a minimum wiring capacity of 38.5-in<sup>3</sup> [630ml]. Each of the six (6) compartments shall have a minimum depth of 3-7/8" [98mm] behind the plate. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. Provide boxes with four (4) intumescent services feed stems with a 1-1/4-inch [32mm] pass-through channel that allows the pathway to close off during a fire. Boxes shall be fully adjustable, accommodating a maximum 2-1/2-inch [64mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. The box shall be able to accept 2-3/4" x 4-1/2" standard size wall plates. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles, workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.

4. Model EFB8S Floor Boxes: Manufactured from stamped steel approved for use on above grade concrete floors, raised floors and wood floors with the same product. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall have a polyester based backed enamel finished interior (white). Boxes shall be 15-3/16" L x 12-3/4" W x 6-1/16" H. Provide boxes with provisions that enable installation into concrete floors, raised floors, or wood floors without having to purchase additional components or accessories. Provide boxes with eight (8) independent wiring compartments that allow for up to eight (8) receptacles, communication and/or audio/video services. Boxes shall accept standard size single gang (2-3/4" x 4-1/2"), double gang (4-9/16" x 4-1/2"), and triple gang (6-3/8" x 4-1/2") wall plates. Boxes shall permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the four (4) outer compartments shall have a minimum wiring capacity of 28-in<sup>3</sup>. Each of the four (4) center compartments shall have a minimum wiring capacity of 34-in<sup>3</sup>. Each of the eight (8) compartments shall have a minimum depth of 3- 1/2" [89mm] behind the plate. Provide boxes with removable compartments to facilitate installation and moves, additions, and changes. The compartments shall be removable from the top and back of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. Provide boxes with removable knockout plates to allow for the maximum cable pass-through area. The cable pass-through area shall be a minimum of 11-5/8 in<sup>2</sup>. The box shall contain the following number of knockouts: four (4) 3/4-inch trade size, eight (8) 1-inch trade size, six (6) 1-1/4-inch trade size, and two (2) 2-inch trade size. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a

maximum 1/2" post-concrete pour adjustment. Equip boxes with toggle clamps to allow box to be secured to raised and wood floors. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles. Boxes shall have the ability to accommodate a bracket (EFB-50A) allowing for one (1) 50-amp receptacle. Boxes shall also accommodate workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.

5. Model EFB8S-OG Floor Boxes: Manufactured from stamped steel approved for use in above grade and on-grade floor applications. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall be painted with a fusion-bonded epoxy designed for use on metal reinforcement bar and related accessories before encapsulation in concrete, and be approved for use on-grade and above grade floors. Boxes shall be 15-3/16" L x 12-5/8" W x 6-1/16" H [385mm x 321mm x 154mm]. Provide boxes with eight (8) independent wiring compartments that allow for up to eight (8) duplex receptacles, communication and/or audio/video services. Boxes shall have removable and relocatable dividers to permit custom configuration of compartments as well as permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the four (4) outer compartments shall have a minimum wiring capacity of 28-in3 [455ml]. Each of the four (4) center compartments shall have a minimum wiring capacity of 34-in3 [455ml]. Each of the eight (8) compartments shall have a minimum depth of 3- 1/2" [89mm] behind the plate. Provide boxes with removable compartments to facilitate installation. The compartments shall be removable from the top of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. The box shall contain the following number of knockouts: 12 1-inch trade size, six (6) 1-1/4-inch trade size, and four (4) 2-inch trade size. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. The box shall be able to accept standard size single gang (2-3/4" x 4-1/2"), double gang (2-3/4" x 4- 1/2"), and triple gang (6-3/8" x 4-1/2") wall plates. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles. Boxes shall have the ability to accommodate a bracket (EFB-50A) allowing for one (1) 50-amp receptacle. Boxes shall also accommodate workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers and other open system devices.
6. Model EFB8S-FC Floor Boxes: Manufactured from stamped steel approved for use in 2-hour fire- rated concrete floors. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall have a polyester based backed enamel finished interior (white). Boxes shall be 15-3/16" L x 13-7/8" W x 4-3/16" H [385mm x 351mm x 107mm]. Provide boxes with a 21-3/4" L x 17-1/4" W x 6-1/2" H [552mm x 438mm x 165mm] sheet metal concrete pan to ensure that 3-1/4 inches [83mm] of concrete surrounds the box. Provide boxes with eight (8) independent wiring compartments that allow for up to eight (8) receptacles, communication and/or audio/video services. Boxes shall have removable and repositionable dividers to permit feed to adjacent compartments and reconfiguration of devices. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the compartments shall have a minimum wiring capacity of 53-in3 [860ml]. Each of the eight (8) compartments shall have a minimum depth of 3-1/2" [89mm] behind the plate. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. Provide boxes with removable compartments to facilitate installation. Provide boxes with four (4) intumescent services

feed stems with a 1-1/4-inch [32mm] pass-through channel that allows the pathway to close off during a fire. Boxes shall be fully adjustable, accommodating a maximum 2-1/2-inch [64mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. The box shall be able to accept standard size single gang (2-3/4" x 4-1/2"), double gang (4-9/16" x 4-1/2"), and triple gang (6-3/8" x 4-1/2") wall plates. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles. Boxes shall have the ability to accommodate a bracket (EFB-50A) allowing for one (1) 50-amp receptacle. Boxes shall also accommodate workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.

7. Model EFB10S Floor Boxes: Manufactured from stamped steel approved for use on above grade concrete floors, raised floors and wood floors with the same product. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall have a polyester based backed enamel finished interior (white). Boxes shall be 15-3/16" L x 12-3/4" W x 6-1/16" H [385mm x 324mm x 154mm]. Provide boxes with provisions that enable installation into concrete floors, raised floors, or wood floors without having to purchase additional components or accessories. Provide boxes with 10 independent wiring compartments that allow for up to 10 receptacles, communication and/or audio/video services. Boxes shall permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Six (6) of the 10 compartments shall have a minimum wiring capacity of 23-1/2-in3 [597ml]. Four (4) of the 10 compartments shall have a minimum wiring capacity of 27-in3 [686ml]. Each of the 10 compartments shall have a minimum depth of 3-1/2" [89mm] behind the plate. Provide boxes with removable compartments to facilitate installation and moves, additions, and changes. The compartments shall be removable from the top and back of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. Provide boxes with removable knockout plates to allow for the maximum cable pass-through area. The cable pass-through area shall be a minimum of 11-5/8 in2 [7500mm2]. The box shall contain the following number of knockouts: four (4) 3/4-inch trade size, 10 1-inch trade size, eight (8) 1-1/4-inch trade size, and two (2) 2-inch trade size. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. Equip boxes with toggle clamps to allow box to be secured to raised and wood floors. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles. Boxes shall have the ability to accommodate a bracket (EFB-50A) allowing for one (1) 50-amp receptacle. Boxes shall also accommodate workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.
8. Model EFB10S-OG Floor Boxes: Manufactured from stamped steel approved for use in above grade and on-grade floor applications. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall be painted with a fusion-bonded epoxy designed for use on metal reinforcement bar and related accessories before encapsulation in concrete, and be approved for use on-grade and above grade floors. Boxes shall be 15-3/16" L x 12-5/8" W x 6-1/16" H [385mm x 321mm x 154mm]. Provide boxes with 10 independent wiring compartments that allow for up to 10 duplex receptacles, communication and/or audio/video services. Boxes shall have removable and relocatable dividers to permit custom configuration of compartments as well as permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a

tunnel. Six (6) of the 10 compartments shall have a minimum wiring capacity of 23-1/2-in<sup>3</sup> [597ml]. Four (4) of the 10 compartments shall have a minimum wiring capacity of 27-in<sup>3</sup> [686ml]. Each of the 10 compartments shall have a minimum depth of 3-1/2" [89mm] behind the plate. Provide boxes with removable compartments to facilitate installation. The compartments shall be removable from the top of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. The box shall contain the following number of knockouts: 14 1-inch trade size, six (6) 1-1/4-inch trade size, and four (4) 2-inch trade size. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles. Boxes shall have the ability to accommodate a bracket (EFB-50A) allowing for one (1) 50-amp receptacle. Boxes shall also accommodate workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.

9. Model EFB10FC Floor Boxes: Manufactured from stamped steel approved for use in 2-hour fire-rated concrete floors. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall have a polyester based backed enamel finished interior (white). Boxes shall be 15-3/16" L x 13-7/8" W x 4-3/16" H [385mm x 351mm x 107mm]. Provide boxes with a 21-3/4" L x 17-1/4" W x 6-1/2" H [552mm x 438mm x 165mm] sheet metal concrete pan to ensure that 3-1/4 inches [83mm] of concrete surrounds the box. Provide boxes with 10 independent wiring compartments that allow for up to 10 receptacles, communication and/or audio/video services. Boxes shall have removable and repositionable dividers to permit feed to adjacent compartments and reconfiguration of devices. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the compartments shall have a minimum wiring capacity of 53-in<sup>3</sup> [860ml]. Each of the 10 compartments shall have a minimum depth of 3-1/2" [89mm] behind the plate. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. Provide boxes with removable compartments to facilitate installation. The compartments shall be removable from the top of the floor box. Provide boxes with four (4) intumescent services feed stems with a 1-1/4-inch [32mm] pass-through channel that allows the pathway to close off during a fire. Boxes shall be fully adjustable, accommodating a maximum 2-1/2-inch [64mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles. Boxes shall have the ability to accommodate a bracket (EFB-50A) allowing for one (1) 50-amp receptacle. Boxes shall also accommodate workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.
10. Model EFBFF Floor Boxes: Manufactured from stamped steel approved for use on above grade concrete floors, raised floors and wood floors with the same product. Boxes shall have the ability to accept a component (FP-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall be 7-1/16" L x 6-5/8" W x 4-1/8" H [179mm x 168mm x 105mm]. Provide boxes with provisions that enable installation into concrete floors, raised floors, or wood floors without having to purchase additional components or accessories. Provide boxes with two (2) independent wiring compartments that allow for power, communication and/or audio/video services. Each of the two (2) wiring compartments shall have a minimum wiring capacity of 64- 1/2-in<sup>3</sup> [1056ml]. The box shall be equipped with a metal divider to separate the services and maintain code requirements. The box shall contain the following number of knockouts:

four (4) 1/2-inch trade size, four (4) 3/4"-inch trade size, one (1) 1-inch trade size, six (6) 1-1/4-inch trade size, one (1) 1-1/2-inch trade size, and two (2) 2-inch. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. Equip boxes with toggle clamps to allow box to be secured to raised and wood floors.

11. Model EFBFF-OG Floor Boxes: Manufactured from stamped steel approved for use in above grade and on-grade floor applications. Boxes shall have the ability to accept a component (FP- CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall be painted with a fusion-bonded epoxy designed for use on metal reinforcement bar and related accessories before encapsulation in concrete, and be approved for use on-grade and above grade floors. Boxes shall be 7-1/16" L x 6-5/8" W x 4-1/8" H [179mm x 168mm x 105mm]. Provide boxes with provisions that enable installation into concrete floors, raised floors, or wood floors without having to purchase additional components or accessories. Provide boxes with two (2) independent wiring compartments that allow for power, communication and/or audio/video services. Each of the two (2) wiring compartments shall have a minimum wiring capacity of 64- 1/2-in<sup>3</sup> [1056ml]. The box shall be equipped with a metal divider to separate the services and maintain code requirements.

The box shall contain the following number of knockouts: four (4) 1/2-inch trade size, four (4) 3/4"-inch trade size, one (1) 1-inch trade size, six (6) 1-1/4-inch trade size, one (1) 1-1/2-inch trade size, and two (2) 2-inch. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment.

- D. Activation Covers: The following model covers shall be used according to the appropriate application.

1. Evolution EFB610BT and EFB610CT Series Covers: Manufactured of die-cast aluminum. Activation covers shall be available in surface mount and flush versions. Provide covers with two (2) gaskets (one (1) for carpet and one (1) for tile) to go under the trim flange to maintain scrub watertightness. Covers shall be 16-15/16" x 12-1/2" x 3/16" [430mm x 318mm x 4mm]. Covers shall be available with a carpet recess area or a solid lid. Secure the cover to the flange and enable cover to rotate greater than 180 degrees to reduce trip hazards and provide maximum amount of working space. Provide covers with spring-loaded self-closing slide egress doors to reduce egress opening when cables are exiting and reduce trip hazards. Each of the two (2) egress openings shall have a minimum of 4-in<sup>2</sup> [102mm<sup>2</sup>], or a minimum of 8-in<sup>2</sup> [203mm<sup>2</sup>] per cover assembly. Cover finish shall be as follows:
2. FloorPort FPFUTC Series Covers: Manufactured of die-cast aluminum or die-cast zinc, and available in brushed aluminum finish and powder-coated paint finishes (black, gray, bronze, nickel and brass). Activation covers shall be available in flanged version. Covers shall come equipped with one (1) 1-inch trade size screw plug opening and one (1) combination 1-1/4-inch and 2-inch trade size screw plug.

- a. Flanged covers shall be 7-3/4" L x 6-9/16" W [197mm x 167mm].

## 2.5 FIRE STOPPING

- A. Fire Stopping materials used for this project shall comply with the following:

1. Products shall allow for normal expansion and contraction movement of the penetrating item without failure of the penetration seal.
2. Products shall emit no hazardous, combustible, or irritating by-products during installation or curing period.
3. Products shall not require special tools for installation.
4. Products shall provide penetration seal assemblies whose fire-resistance ratings have been determined by testing in the configurations required and which have fire-resistance ratings at least as high as that of the fire-rated assembly in which they are to be installed.
5. All fire stopping shall be manufactured by the following:
  - a. Bio Fireshield, Inc.
  - b. Dow Corning Corp.
  - c. GE Silicones, Hilti, Inc.
  - d. 3M Ceramic Materials.
  - e. Or Approved Equal

### PART 3 - EXECUTION

#### 3.1 PATHWAYS

- A. Pathways shall be designed and installed to meet applicable local and national building and electrical codes or regulations and shall have no exposed sharp edges that may come into contact with data or telecommunications cables.
- B. All wall penetrations shall be installed with sleeves that shall have no exposed sharp edges that may come into contact with data or telecommunications cables.
- C. Pathways shall not be located in elevator shafts unless specifically approved by the Design Consultant in writing.

#### 3.2 CABLE PATHWAYS

- A. Horizontal pathways shall be installed or selected such that the minimum bend radius of horizontal cables is kept within manufacturer specifications both during and after installation.
- B. Cable pathways, which run parallel with electric power or lighting that is less than or approved equal to 480 Vrms, shall be installed with a minimum clearance of 6 in.
- C. In the MDF/IDF(s) where cable trays or cable racking are used, the appropriate means of cable management such as reusable color-coded hook and loop cable managers (ties) shall be used to create a neat appearance and practical installation.
- D. Continuous conduit runs installed by the contractor should not exceed 100 feet or contain more than two (2) 90 degree bends without utilizing appropriately sized pull boxes.
- E. All horizontal pathways shall be designed, installed and grounded to meet applicable local and national building and electrical codes.

#### 3.3 FIRE PROTECTION

- A. All wall penetrations shall require properly installed firestop systems code compliant that shall be installed to prevent or retard the spread of fire, smoke, water, and gases through the building.

- B. Sheathing installed for wall penetrations must also be firestopped.
- C. Fire stops shall be done to applicable code using approved materials.

END OF SECTION 270528

## SECTION 271000 – STRUCTURED CABLING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Wire, cable, and connecting devices for wiring systems to be used as signal pathway or voice, and high-speed data transmission.
- B. System Diagram: Refer to T-Drawings

### PART 2 - PRODUCT

#### 2.1 MATERIALS

- A. Acceptable Manufacturers
  - 1. Belden CDT Inc.; Electronics Division.
  - 2. Berk-Tek; a Nexans company.
  - 3. CommScope, Inc.
  - 4. Or approved equal.

#### 2.2 TWISTED – PAIR CABLES, CONNECTORS AND TERMINAL EQUIPMENT

- A. Voice Backbone, 100 Pair Category 6 UTP cable.
- B. Conductors: Solid cooper conductors
- C. Cross-connect panel rack mounted
- D. Patch panel, rack mounted
- E. Horizontal UTP, 4-pair Category 6
- F. Workstation Outlets: Category 6 jack-connector assemblies.

#### 2.3 FIBER-OPTIC CABLES, CONNECTORS, AND TERMINAL EQUIPMENT:

- A. Cables: Factory fabricated, jacketed, glass type, multimode, graded index.
- B. Backbone, Strands per cable: 12 (6 pair)
- C. Patch panel Rack mounted

#### 2.4 COAXIAL CABLES, CONNECTORS AND TERMINAL EQUIPMENT

- A. Video Backbone: RG11 with double braid and tape shield.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLICATION OF MEDIA

- A. Backbone Cable for Data Service: Use multi-mode fiber-optic cable for runs between equipment rooms and wiring closets and for runs between wiring closets.
- B. Backbone Cable for Voice Service: Use UTP Category 3, 100 pair, for runs between equipment rooms and wiring closets and for runs between wiring closets.
- C. Horizontal Cable for Data Service: Use UTP Category 6 cable for runs between wiring closets (MDF/IDFs) and workstation outlets.
- D. Horizontal Cable for Voice Service: Use UTP Category 6 cable for runs between wiring closets (MDF/IDFs) and workstation outlets.

### 3.3 INSTALLATION

- A. Wiring Method: Install wiring and optical fiber in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.
- B. Install cables using techniques, practices, and methods that are consistent with Category 6 rating of components and that ensure Category 6 performance of completed and linked signal paths, end to end.
- C. Install cables without damaging conductors, shield, or jacket.
- D. Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by manufacturer.
- E. Pull cables without exceeding cable manufacturer's recommended pulling tensions.
  - 1. Pull cables simultaneously if more than one is being installed in same raceway.
  - 2. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
  - 3. Use pulling means, including fish tape, cable, rope, and basket-weave wire or cable grips that will not damage media or raceway.
- F. Install exposed cables parallel and perpendicular to surfaces or exposed structural members and follow surface contours where possible.
- G. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

- H. Wiring within Wiring Closets and Enclosures: Provide conductors of adequate length. Train conductors to terminal points with no excess. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radius than minimums recommended by manufacturer.
- I. Separation of Wires: Comply with TIA/EIA-569-A rules for separating unshielded copper voice and data communication cabling from potential EMI sources, including electrical power lines and equipment.
- J. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.
- K. Use splice and tap connectors compatible with media types.

#### 3.4 GROUNDING

- A. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
- B. Signal Ground Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
- C. Signal Ground Bus: Mount on wall of main equipment room with standoff insulators.
- D. Signal Ground Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

#### 3.5 INSTALLATION IN EQUIPMENT ROOMS AND WIRING CLOSETS

- A. Install plywood backboards (furnished by others) on walls of equipment rooms and wiring closets.
- B. Mount patch panels, terminal strips, and other connecting hardware on backboards, unless otherwise indicated.
- C. Group connecting hardware for cables into separate logical fields.
- D. Use patch panels to terminate cables entering the space, unless otherwise indicated.

#### 3.6 INSTALLATION STANDARDS

- A. Comply with requirements in TIA/EIA-568-A and TIA/EIA-569-A.

#### 3.7 IDENTIFICATION

- A. In addition to requirements in this Article, comply with applicable requirements in TIA/EIA-606.
- B. Workstation: Label cables within outlet boxes.
- C. Distribution Racks and Frames: Label each unit and field within that unit.

- D. Within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- E. Cables, General: Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
- F. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m)
- G. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project, in software and format selected by the Authority.
- H. Cable Administration Drawings: Show building floor plans with cable administration point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606. Furnish electronic record of all drawings, in software and format selected by the Authority.

### 3.8 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
  1. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.
  2. Copper Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2, bi-directional, Category 6 tester. Test for faulty connectors, splices, and terminations. Test according to TIA/EIA-TSB 67, "Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems." Link performance for UTP cables must meet minimum criteria of TIA/EIA-568-A.
  3. Fiber-Optic Cable Procedures: Perform each visual and mechanical inspection and electrical test, including optional procedures, stated in NETA ATS, Section 7.25. Certify compliance with test parameters and manufacturer's written recommendations. Test optical performance with optical power meter capable of generating light at all appropriate wavelengths.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

### 3.9 TESTING, IDENTIFICATION AND ADMINISTRATION

- A. Copper Cable
  1. All Category 6 UTP cable shall be tested to a frequency of 350MHz to demonstrate compliance with the individual manufacturers advertised electrical characteristics.

2. All Category 6 UTP cable shall be field-tested with connectivity products installed to a frequency of 250MHz to demonstrate performance equal to or better than the minimum requirements as specified in ANSI/TIA/EIA-568b.2.1 and as listed in Table 1.
3. The Test Model shall be Permanent Link

TABLE 1 - Category 6 Permanent Link Limits in dB per ANSI/TIA/EIA-568B.2-1

Parameter	Performance @ 100MHz	Performance @ 200MHz	Performance @ 250MHz	Performance @ 300MHz
Insertion Loss	19.0 dB	27.4 dB	30.9 dB	34.1 dB
NEXT Loss	43.9 dB	39.3 dB	37.8 dB	36.6 dB
PS NEXT Loss	41.9 dB	37.3 dB	35.8 dB	34.6 dB
ACR	24.9 dB	11.9 dB	6.9 dB	2.5 dB
PS ACR	22.9 dB	9.9 dB	4.9 dB	0.5 dB
ELFEXT	26.3 dB	20.3 dB	18.3 dB	16.8 dB
PS ELFEXT	23.4 dB	17.3 dB	15.4 dB	13.8 dB
Return Loss	14.7 dB	11.7 dB	10.7 dB	9.9 dB
Propagation Delay	528 ns	527 ns	526 ns	526 ns
Delay Skew	40 ns	40 ns	40 ns	40 ns

4. All testing shall be performed with a UTP/ScTP field test device that has been factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided for review prior to the start of testing.
5. Autotest settings provided in the field tester for testing the installed cabling shall be set to the default parameters.
6. Test settings selected from options provided in the field testers shall be compatible with the installed cable under test.
7. UTP horizontal and backbone cables shall be 100 percent tested according to ANSI/TIA/EIA-TSB-67 and ANSI/TIA/EIA-568-B.2.1. Test parameters include wire map plus shield continuity (when present), length, NEXT loss (pair-to-pair), NEXT loss (power sum), ELFEXT loss (pair-to-pair), ELFEXT loss (power sum), return Loss, attenuation, propagation delay, and delay skew.

B. Fiber Optic Cable

1. Backbone
  - a. Fiber backbone cables shall be 100% tested for attenuation and length.
  - b. Attenuation shall be tested at 850 nm and 1300 nm for 50/125 nm multimode in at least one direction using the 2-jumper method.
  - c. Acceptable attenuation test results shall be determined using the following calculation:
    - 1) Link attenuation = cable attenuation + connector attenuation + splice attenuation.
    - 2) Cable attenuation, connector attenuation and splice attenuation are determined by each of the following formulas:
      - a) Cable Attenuation:  
 Cable attn. (dB) = Attn. coefficient (dB/km) x length (km)  
 Attenuation Coefficient = 3.0 dB/km @ 850 nm

- b) Connector Attenuation:  
Connector attn. (dB) = number of connector pairs x connector loss = 2 x 0.65 dB = 1.3 dB
- c) Splice Attenuation:  
Splice attn. (dB) = number of splices (s) x splice loss (dB) = s x 0.3 dB
- d. The Backbone Channel performance guarantees are as follows:
  - 1) Max Attenuation 850/1300 nm: 3.0/1.0 dB 2) Bandwidth 850/1300 nm: 1500/500 MHz/km
  - 3)   Min. Return Loss: 20dB
  - 4) For each additional mated pair of connectors, add the following to the attenuation values as noted in above chart:
    - a) add 0.75 dB @ 850nm
    - b) add 0.65 dB @ 1300nm
  - 5) For each splice, add 0.30 dB to the attenuation values as noted in above chart (applicable to both M/M and S/M).

### 3.10 CUTOVER

- A. The contractor shall place cross connects at Telecommunication Equipment Rooms.

### 3.11 Training

- A. Authority training shall include:
  - 1. Physical review of installed cable plant.
  - 2. Review of cable plant documentation and test results.
  - 3. Instructions on industry standard termination and testing methods to enable customer personnel to successfully terminate and test cabling.

### 3.12 DEMONSTRATION

- A. Train the Authority's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and extending wiring to establish new workstation outlets.

END OF SECTION 271000

## SECTION 271100 – COMMUNICATIONS EQUIPMENT ROOM FITTINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Telecommunications mounting elements.
2. Backboards.
3. Telecommunications pathways.
4. Grounding.

##### B. Related Sections:

1. Division 27 Section "Communications Backbone Cabling" for voice and data cabling associated with system panels and devices.
2. Division 27 Section "Communications Horizontal Cabling" for voice and data cabling associated with system panels and devices.
3. Division 28 Section "Conductors and Cables for Electronic Safety and Security" for voice and data cabling associated with system panels and devices.

#### 1.2 SUBMITTALS

##### A. Product Data: For each type of product indicated.

##### B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies, and location and size of each field connection.
2. Equipment racks and cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of grounding bus bar and its mounting detail.

##### C. Qualification Data: For BICSI RCDD or experienced equivalent qualified layout technician, installation supervisor, and field inspector.

#### 1.3 QUALITY ASSURANCE

##### A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of an RCDD to be specified on the drawings.
2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician or Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as RCDD to perform the on-site inspection.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- D. Grounding: Comply with ANSI-J-STD-607-A and NFPA 70.

#### 1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install equipment frames, cable trays and cabling until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and work above ceilings is complete.

#### 1.5 COORDINATION

- A. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.
  - 1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
  - 2. Record agreements reached in meetings and distribute them to other participants.
  - 3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

### PART 2 - PRODUCTS

#### 2.1 PATHWAYS

- A. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable.
  - 1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
  - 2. Neatly support cabling and brackets; utilize cable tie slots for fastening cable ties to brackets, lacing bars, spools, J-hooks, and D-rings, Straps and other devices.
    - a. .
- B. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.
  - 1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.
  - 2. Increase effective depth of 4" square boxes by adding extensions to meet depth requirements. Plaster ring depth can be used to meet depth requirement.

## 2.2 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. All grounding conductors for communications shall be copper.
- C. Telecommunications Main Bus Bar:
  - 1. Connectors: Mechanical type, cast silicon bronze, solderless-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
  - 2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.
  - 3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.
- D. Comply with ANSI-J-STD-607-A.

## 2.3 LABELING

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

## PART 3 - EXECUTION

### 3.1 ENTRANCE FACILITIES

- A. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.
- B. Install underground/buried/aerial pathways complying with design documents and recommendations in TIA/EIA-569-A, "Entrance Facilities" Article.
- C. Install underground/buried/aerial entrance pathway complying with Division 26 Section "Raceway and Boxes for Electrical Systems."INSTALLATION
- D. Comply with NECA 1.
- E. Comply with BICSI TDMM for layout and installation of communications equipment rooms.
- F. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.
- G. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- H. Cables shall not be installed using building steel as a cable support.

### 3.2 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Firestopping." Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- B. Comply with BICSI TDMM, "Firestopping Systems" Article.

### 3.3 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with ANSI-J-STD-607-A.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar in each IDF with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to the grounding bus bar in the MDF.
- D. Connect grounding bus bar in the MDF to the grounding electrode of the panel serving the MDF equipment with 2 minimum No. 4 AWG conductor.
- E. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

### 3.4 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Division 26 Section "Identification for Electrical Systems." Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- B. See Division 27 Section "Communications Horizontal Cabling" for additional identification requirements. See Evaluations for discussion of TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration.
- C. Labels shall be preprinted or computer-printed type.

END OF SECTION 271100

## SECTION 271300 – COMMUNICATIONS BACKBONE CABLING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Pathways.
2. UTP cable.
3. Fiber Optic cable.
4. Cable connecting hardware, patch panels, and cross-connects.
5. Cabling identification products.

B. Related Sections:

1. Division 28 Section "Conductors and Cables for Electronic Safety and Security" for voice and data cabling associated with system panels and devices.

#### 1.2 BACKBONE CABLING DESCRIPTION

A. Backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

#### 1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

#### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. Cabling administration drawings and printouts.
3. Wiring diagrams to show typical wiring schematics including the following:
  - a. Cross-connects.
  - b. Patch panels.

- c. Patch cords.
- 4. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
- 5. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements.
- C. Qualification Data: For RCDD qualified layout technician, installation supervisor, and field inspector.
- D. Warranty: Provide manufacturer's system warranty against electrical or mechanical defects for 2 years from date of final acceptance.
- E. Source quality-control reports.
- F. Field quality-control reports.
- G. Maintenance data.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
  - 1. Layout Responsibility: Preparation of Shop Drawings and Cabling detail /administration Drawings by an RCDD.
  - 2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician or Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 25 or less.
  - 2. Smoke-Developed Index: 50 or less.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- E. Grounding: Comply with ANSI-J-STD-607-A and NFPA 70.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site. Test each pair of UTP cable for open and short circuits.

## PART 2 - PRODUCTS

### 2.1 PATHWAYS

- A. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable.
1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
  2. Neatly support cabling and brackets; utilize cable tie slots for fastening cable ties to brackets, lacing bars, spools, J-hooks, and D-rings, Straps and other devices.

### 2.2 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Belden CDT Inc.; Electronics Division.
  2. CommScope, Inc.
  3. Leviton
  4. Superior Essex Inc.
  5. SYSTIMAX Solutions; a CommScope Inc. brand.
- B. Description: 100-ohm, 100 -pair UTP, formed into 25-pair binder groups covered with a gray thermoplastic jacket and overall metallic shield.
1. Comply with ICEA S-90-661 for mechanical properties.
  2. Comply with TIA/EIA-568-B.1 for performance specifications.
  3. Comply with TIA/EIA-568-B.2, Category 6.
  4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
    - a. Communications, General Purpose: Type CM or CMG
    - b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
    - c. Communications, Riser Rated: Type CMR, complying with UL 1666.
    - d. Communications, Limited Purpose: Type CMX.
    - e. Multipurpose: Type MP or MPG.
    - f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
    - g. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

### 2.3 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hubbell Premise Wiring.
  2. Leviton Voice & Data Division.
  3. Panduit Corp.

- B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
  - 1. Number of Terminals per Field: One for each conductor in assigned cables.
- E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
  - 1. Number of Jacks per Field: One for each four-pair Category 6 conductor group of indicated cables, plus spares and blank positions adequate to suit specified expansion criteria.
- F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
- G. Patch Cords: Factory-made (pre-fab), 4-pair cables in 36 and 48-inch lengths; terminated with 8-position modular plug at each end.
  - 1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
  - 2. Patch cords shall have color-coded boots for circuit identification.

## 2.4 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors.
- B. Comply with ANSI-J-STD-607-A.

## 2.5 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

## 2.6 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.

- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

## PART 3 - EXECUTION

### 3.1 ENTRANCE FACILITIES

- A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

### 3.2 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
  - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
  - 2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

### 3.3 INSTALLATION OF PATHWAYS

- A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A.
- B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.
- C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- D. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- E. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- F. Pathway Installation in Communications Equipment Rooms:
  - 1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.

2. Install cable trays to route cables if conduits cannot be located in these positions.
  3. Secure conduits to backboard when entering room from overhead.
  4. Extend conduits 3 inches above finished floor.
  5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- G. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

### 3.4 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
10. In the communications equipment room, install a 10-footlong service loop on each end of cable.
11. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

F. Group connecting hardware for cables into separate logical fields.

G. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
  - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
  - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
  - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
  - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
  - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

### 3.5 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Firestopping." Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- B. Comply with BICSI TDMM, "Firestopping Systems" Article.

### 3.6 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with ANSI-J-STD-607-A.

- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

### 3.7 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
  - 1. Administration Class: 2
  - 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- C. See Evaluations for discussion about TIA/EIA standard as it applies to this Section. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration including optional identification requirements specified on drawings and/or in of this standard.
- D. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- F. Cable and Wire Identification:
  - 1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
  - 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
  - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
  - 4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
    - a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
    - b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

### 3.8 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect UTP jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.

2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

3. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

B. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

C. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

D. Prepare test and inspection reports.

END OF SECTION 271300



## SECTION 271500 – COMMUNICATIONS HORIZONTAL CABLING

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Pathways.
2. UTP cabling.
3. Multiuser telecommunications outlet assemblies.
4. Cable connecting hardware, patch panels, and cross-connects.
5. Telecommunications outlet/connectors.
6. Cabling identification products.
7. Cabling administration system

##### B. Related Sections:

1. Division 27 Section "Communications Backbone Cabling" for voice and data cabling associated with system panels and devices.
2. Division 28 Section "Conductors and Cables for Electronic Safety and Security" for voice and data cabling associated with system panels and devices.

#### 1.2 HORIZONTAL CABLING DESCRIPTION

##### A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
3. Bridged taps and splices shall not be installed in the horizontal cabling.

#### 1.3 PERFORMANCE REQUIREMENTS

##### A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

#### 1.4 SUBMITTALS

- ##### A. Product Data: For each type of product indicated.
- ##### B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics, including the following:
  - a. Cross-connects.
  - b. Patch panels.
  - c. Patch cords.
5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
6. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:
  - C. Samples: For workstation outlets, jacks, jack assemblies, in specified finish, one for each size and outlet configuration and faceplates for color selection and evaluation of technical features.
  - D. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.
  - E. Source quality-control reports.
  - F. Field quality-control reports.
  - G. Maintenance data.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
  1. Layout Responsibility: Preparation of Shop Drawings and Cabling Administration Drawings, and field testing program development by an RCDD.
  2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician or Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  1. Flame-Spread Index: 25 or less.
  2. Smoke-Developed Index: 50 or less.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- E. Grounding: Comply with ANSI-J-STD-607-A.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site. Test each pair of UTP cable for open and short circuits.

## PART 2 - PRODUCTS

### 2.1 PATHWAYS

- A. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
  - 1. Support brackets with cable tie slots for fastening cable ties to brackets.
  - 2. Lacing bars, spools, J-hooks, and D-rings.
  - 3. Straps and other devices.
- B. Cable Trays:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cablofil Inc.
    - b. Cooper B-Line, Inc.
    - c. Chatsworth Products Inc.
    - d. Or Approved Equal
- C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.
  - 1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

### 2.2 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Telecommunications Main Bus Bar:
  - 1. Connectors: Mechanical type, cast silicon bronze, solderless-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
  - 2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.
  - 3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.
- C. Comply with ANSI-J-STD-607-A.

## 2.3 LABELING

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

## 2.4 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Belden CDT Inc.; Electronics Division.
  - 2. Leviton
  - 3. Superior Essex Inc.
  - 4. Or Approved Equal.
- B. Description: 100-ohm, 100 -pair UTP, formed into 25-pair binder groups covered with a gray thermoplastic jacket and overall metallic shield.
  - 1. Comply with ICEA S-90-661 for mechanical properties.
  - 2. Comply with TIA/EIA-568-B.1 for performance specifications.
  - 3. Comply with TIA/EIA-568-B.2, Category 6.
  - 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
    - a. Communications, General Purpose: Type CM or CMG
    - b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
    - c. Communications, Riser Rated: Type CMR, complying with UL 1666.
    - d. Communications, Limited Purpose: Type CMX.
    - e. Multipurpose: Type MP or MPG.
    - f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
    - g. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

## 2.5 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Leviton Voice & Data Division.
  - 2. Hubbell Premise Wiring.
  - 3. Panduit Corp.
  - 4. Or Approved Equal
- B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.
- E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
1. Number of Jacks per Field: One for each four-pair Category 6 conductor group of indicated cables, plus spares and blank positions adequate to suit specified expansion criteria.
- F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
- G. Patch Cords: Factory-made (pre-fab), 4-pair cables in 36 and 48-inch lengths; terminated with 8-position modular plug at each end.
1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
  2. Patch cords shall have color-coded boots for circuit identification.

## 2.6 CONSOLIDATION POINTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Superior Essex
  2. Chatsworth Products, Inc.
  3. Leviton Inc.
  4. Hubbell Premise Wiring.
  5. Or Approved Equal.
- B. Description: Consolidation points shall comply with requirements for cable connecting hardware.
1. Number of Terminals per Field: One for each conductor in assigned cables.
  2. Number of Connectors per Field:
    - a. One for each four-pair UTP cable indicated.
    - b. One for each four-pair conductor group of indicated cables, plus 25 percent spare positions.
  3. Mounting: as indicated in construction drawings
  4. NRTL listed as complying with UL 50 and UL 1863.
  5. When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

## 2.7 MULTIUSER TELECOMMUNICATIONS OUTLET ASSEMBLY (MUTOA)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Chatsworth Products, Inc.

2. Leviton Inc.
3. Hubbell Premise Wiring.
4. Or Approved Equal.

B. Description: MUTOAs shall meet the requirements for cable connecting hardware.

1. Number of Terminals per Field: One for each conductor in assigned cables.
2. Number of Connectors per Field:
  - a. One for each four-pair UTP cable indicated.
  - b. One for each four-pair conductor group of indicated cables, plus 25 percent spare positions.
3. Mounting: as indicated in construction drawings.
4. NRTL listed as complying with UL 50 and UL 1863.
5. Label shall include maximum length of work area cords, based on TIA/EIA-568-B.1.
6. When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

## 2.8 TELECOMMUNICATIONS OUTLET/CONNECTORS

- A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.
- B. Workstation Outlets: Two or Four-port-connector assemblies mounted in single or multigang faceplate as indicated in the construction drawings.
  1. Plastic Faceplate: High-impact plastic. Coordinate color with Division 26 Section "Wiring Devices."
  2. Metal Faceplate: Stainless steel, complying with requirements in Division 26 Section "Wiring Devices."
  3. For use with snap-in jacks accommodating any combination of UTP work area cords.
    - a. Flush mounting jacks, positioning the cord at a 45-degree angle.
  4. Legend: Factory labeled by silk-screening or engraving for stainless steel faceplates.
  5. Legend: Machine printed, in the field, using adhesive-tape label.
  6. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

## 2.9 GROUNDING

- A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Comply with ANSI-J-STD-607-A.

## 2.10 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

- B. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

#### 2.11 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

### PART 3 - EXECUTION

#### 3.1 ENTRANCE FACILITIES

- A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

#### 3.2 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, in attics, and in gypsum board partitions where unenclosed wiring method may be used as specified in the construction drawings. Conceal raceway and cables except in unfinished spaces.
  - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
  - 2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

#### 3.3 INSTALLATION OF PATHWAYS

- A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.
- B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Division 27 Section "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.
- C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

- D. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- E. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- F. Pathway Installation in Communications Equipment Rooms:
  - 1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
  - 2. Install cable trays to route cables if conduits cannot be located in these positions.
  - 3. Secure conduits to backboard when entering room from overhead.
  - 4. Extend conduits 3 inches above finished floor.
  - 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- G. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

### 3.4 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
  - 1. Comply with TIA/EIA-568-B.1.
  - 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
  - 3. Install 110-style IDC termination hardware unless otherwise indicated.
  - 4. MUTOA shall not be used as a cross-connect point.
  - 5. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:
    - a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
    - b. Locate consolidation points for UTP at least 49 feet from communications equipment room.
  - 6. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
  - 7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  - 8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
  - 9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
  - 10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
  - 11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
  - 12. In the communications equipment room, install a 10-foot long service loop on each end of cable.

13. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- C. UTP Cable Installation:
1. Comply with TIA/EIA-568-B.2.
  2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.
- D. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
  2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
  3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- E. Installation of Cable Routed Exposed under Raised Floors:
1. Install plenum-rated cable only.
  2. Install cabling after the flooring system has been installed in raised floor areas.
  3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.
- F. Group connecting hardware for cables into separate logical fields.
- G. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA/EIA-569-A for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
  2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
  3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
  4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
    - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 12 inches.

### 3.5 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Firestopping."
- B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

### 3.6 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. Comply with ANSI-J-STD-607-A.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

### 3.7 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
  1. Administration Class: 2.
  2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.
- B. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- C. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration, including optional identification requirements of this standard.
- D. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets,

backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.

F. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
  - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
  - b. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
6. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.

G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

### 3.8 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect UTP cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
  - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and

adapters that are qualified by test equipment manufacturer for channel or link test configuration.

5. UTP Performance Tests:

a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:

- 1) Wire map.
- 2) Length (physical vs. electrical, and length requirements).
- 3) Insertion loss.
- 4) Near-end crosstalk (NEXT) loss.
- 5) Power sum near-end crosstalk (PSNEXT) loss.
- 6) Equal-level far-end crosstalk (ELFEXT).
- 7) Power sum equal-level far-end crosstalk (PSELFEXT).
- 8) Return loss.
- 9) Propagation delay.
- 10) Delay skew.

6. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.

a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.

b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

B. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

C. Prepare test and inspection reports.

### 3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.

END OF SECTION 271500

## SECTION 272000 – DATA COMMUNICATIONS

### PART 1 - CODES, STANDARDS, AND REGULATIONS

- 1.1 Communication design shall comply with Federal and State codes, regulations, and standards with variances adopted as standards by the NJSDA. Applicable state and national standards include the latest editions of:
- A. ANSI/NFPA 70 National Electrical Code with New Jersey Amendments
  - B. BICSI CO-OSP Customer Owned Outside Plant Manual
  - C. BICSI 12th Edition Telecommunications Distribution Methods Manual
  - D. BICSI 3rd Edition Customer Owned Outside Plant Design Manual
  - E. EIA Standard EIA-230 - Color Marking of Thermoplastic Wire
  - F. FCC Rules and Regulations:
    - 1. J-STD-607-A Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications National Electrical Safety Code
    - 2. NFPA 101: Life Safety Code REA Standards for Engineering, Construct
    - 3. TIA 526-14-A Optical Power Loss Measurements for Installed Multimode Fiber Cable Plant–OFSTP-7
    - 4. TIA 568-C Commercial Building Telecommunications Cabling
    - 5. TIA 569-B Commercial Building Standard for Telecommunications Pathways and Spaces
    - 6. TIA Standard ANSI/TIA/EIA-607-A - Commercial Building Grounding and Bonding Requirements for Telecommunications
    - 7. TIA 604 Standards on Fiber Optic Connector Intermateability
    - 8. TIA 606-A Administration Standard for Commercial Telecommunications Infrastructure Standard
    - 9. TIA 758-A Customer Owned Outside Plant Telecommunications Cabling Standard
    - 10. TIA Telecommunication Systems Bulletin TSB67 - Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems
    - 11. TSB-140 Additional Guidelines for Field Testing Length, Loss and Polarity of Optical Fiber Cabling Systems
    - 12. In the event of a conflict between the Electrical Standards (D50, D60 and D70) and other guidance documents, the Education Specifications, the SDA's Kit of Parts, Bridging Documents also known as the Design Builder's Information Package and presiding codes shall take precedence.
- 1.2 Data Communications Network Equipment/Design Approach:
- A. Main Distribution Frame (MDF) / Intermediate Distribution Frame (IDF) Description:
    - 1. Main Distribution Frame (MDF) - A Main Distribution Frame shall be provided to distribute connectivity to the IDF, station cabling as required and to house the main control equipment of the following systems:
      - a. Local Area Network
      - b. Wide Area Network
      - c. Carrier/Service Provider Interconnections

- d. Telephone System
  - e. Paging/Intercom System
  - f. Clock Systems
  - g. Internet Protocol Digital Video Surveillance (IPDVS) System
  - h. Digital Video Distribution System
  - i. Building Management System
2. Any station cabling that does not exceed 80-Meters (262 Feet) in length shall be homerun to the Main Distribution Frame.
  3. Intermediate Distribution Frame (IDF) - Intermediate Distribution Frame shall be provided to distribute core connectivity from the MDF to station cabling where cable distances exceed 80-Meters (262 Feet) to the MDF
  4. The designated MDF shall have a single room UPS capable of supporting all devices within the room for up to three hundred (300) seconds (five (5) minutes) of operation at full capacity. Ability to manage and view UPS statistics via IP Based connectivity.
  5. For room based UPS Systems a bypass mode shall be included and must provide an alternate path for utility power to the connected load in the event of planned maintenance activities or a UPS malfunction.
  6. IDF's and Server cabinets outside of the MDF with access to building generator power shall have rack based UPS systems capable of supporting all devices within the rack/cabinet for up to three hundred (300) seconds (five (5) minutes) of operation at full capacity. Ability to manage and view UPS statistics via IP Based connectivity.
  7. IDF's and Server cabinets outside of the MDF with access to building generator power shall have rack based UPS systems capable of supporting all devices within the rack/cabinet for up to three hundred (300) seconds (five (5) minutes) of operation at full capacity. Ability to manage and view UPS statistics via IP Based connectivity.
  8. All server cabinets housed in the MDF shall have 48 Port Category 6 Compliant 110- type rack-mounted patch panels provided on the "rear" of the cabinet. This panel shall terminate on a 2 post telecom/network rack to supply network connectivity for devices inside the cabinets.
  9. Controlled access to the Main Telecommunications Room and Intermediate Telecommunications Closet shall be provided. This can be accomplished with a lock, card reader or other approved mechanism.
  10. The Main Telecommunications Room shall be built in accordance with "DCA Best Practices Standards for Schools under Construction or Planned for Construction."

B. Routing – at a Minimum Routers Must Support:

1. Open Shortest Path First (OSPF)
2. Enhanced Interior Gateway Routing Protocol (EIGRP)
3. Routing Information Protocol (RIP), and RIPv2
4. Two (2) - 10/100/1000-T Copper based
5. One (1) - Small form-factor pluggable (SFP) based slot
6. Four (4) - Enhanced High-Speed WAN Interface Cards (EHWIC)
7. Three (3) Digital Signal Processors (DSP) slots
8. One (1) Internal Services Module (ISM) slot
9. Flash: Support up to 4 GB (Gigabytes)
10. RAM: Support up to 2.5 GB (Gigabytes)
11. RJ-45 Console serial port and USB Console Serial Port
12. Management Capabilities via IP / SNMP / Telnet / SSH / HTTP(S)

C. Switching - at a Minimum Switches Must Support:

1. MDF – A core switch housed within the MDF must meet these minimum requirements:
2. Modular Chassis Switch with 7, 9 or 13 Slots
3. Supervisor engine redundancy
4. 19" (19-inch) rack compatible
5. Redundant 4200W Power Supply
6. IEEE 802.3af/at compliant PoE/PoEP
7. Hot swappable
8. 280-Gbps (Gigabits per second) switching capacity
9. IP routing protocols: Enhanced Interior Gateway Routing Protocol (EIGRP), Open Shortest Path
10. First (OSPF), Routing Information Protocol (RIPv2)
11. IEEE 802.1Q VLAN Encapsulation 12. 802.1s, 802.1w, 802.3ad
12. 13. 802.3af/at (PoE)
13. Ether Channel bonding across line cards
14. Port Aggregation Protocol (PAgP)
15. Voice VLAN and VLAN ID (VVID)
16. Jumbo Frames (up to 9216 bytes)
17. Traffic Storm Control and/or Broadcast/Multicast Suppression
18. Bridge Protocol Data Unit (BPDU) Guard
19. Link Layer Discovery Protocol (LLDP)
20. Switches housed in MDF and IDF rooms support 10 Gigabit Ethernet Connectivity between IDF and MDF rooms. 1-Gigabit Ethernet Connectivity to each station drop.

D. IDF - Switches Housed Within the IDF Must Meet These Minimum Requirements:

1. Stackable with each node member switch being able to serve as a master, creating a 1:N availability scheme for network control.
2. Inter-connection via a channel or bus cable
3. 1100W (minimum) Power Supply
4. Power over Ethernet (PoE) capable on all copper based ports. 802.3af and 802.3at Standards
5. All ports must support 1-Gigabit Ethernet connectivity
6. IP routing protocols: Enhanced Interior Gateway Routing Protocol (EIGRP), Routing Information Protocol (RIPv2)
7. Wireless Data (Wi-Fi) Communications System - A wireless access network shall span all occupy able spaces through the entire facility.
8. Must utilize a centralized controller that allows management of wireless network as a whole.
  - a. Allow for management of individual access points.
  - b. Application of site wide wireless access policies.
9. Shall be capable of providing:
  - a. IEEE 802.11a, 802.11b, 802.11g, 802.11n, 802.11ac
  - b. Encryption WEP and TKIP-MIC; SSL and TLS; AES (CCM, CCMP)
  - c. Authentication, Authorization, and Accounting (AAA); IEEE 802.1X; RADIUS; PPP EAP-TLS; Extensible Authentication Protocol (EAP) with RADIUS
10. Wireless Node Isolation.
11. IEEE 802.1Q VLAN tagging; intra-VLAN security; VLAN Isolation

## PART 2 - VOICE COMMUNICATIONS

### 2.1 Telephone System Description

#### A. General

1. The intent is to provide a school wide Voice over IP (VoIP) Telephone System with voicemail capabilities. The Telephone System and the Data Systems shall share physical cabling mediums and strive for maximum integration.

#### B. Equipment and Locations

1. All processing and head end systems required for voice communications shall be housed in the Main Distribution Frame (MDF) room.
2. Telephones outlet and handset shall be provided in all administrative areas, class rooms, offices, security desks and other specified locations.
3. Wall telephone outlet without lock box and handset shall be provided in utility rooms, storage rooms greater than 200 sq. ft., mechanical rooms, elevator machine room, supply rooms and vault room.
4. Dedicated phone lines (not through the IP Private Branch Exchange (PBX)) shall be provided for the Intrusion Alarm System, Fire Pump, and Elevator Intercom System.
5. A loud Bell is to be placed in noisy areas including the auditorium, gymnasium, gymatorium, student cafeteria, kitchen and the boiler room. A loud bell may be required in other noisy areas; however, this will be addressed on a case by case basis and will be determined by the contract documents.

## PART 3 - VOICE COMMUNICATIONS SWITCHING AND ROUTING EQUIPMENT

### 3.1 Internet Protocol Private Branch Exchange (IP PBX) Minimum Requirements

- A. H.323 and SCCP protocol support
- B. IP Based SIP, Digital (PRI / BRI) and POTS line carrier interface (Trunk)
- C. Analog Telephone Adaptor (ATA)/ Foreign eXchange Subscriber (FXS) Adapter support up to 20 line appearances per phone
- D. Support of fallback service phone auto-registration
- E. IP Handsets; Software phone client.
- F. Foreign eXchange Office (FXO) interface for analog systems.
- G. E911 with two emergency location numbers per zone; unlimited zones per site
- H. Paging: Internal through IP phones or to external paging system
- I. Ad-hoc conferencing
- J. Push Button intercom and Night Bell capabilities.
- K. Multiple music-on-hold (MoH) streams (internal/external)

## PART 4 - VOICE COMMUNICATIONS TERMINAL EQUIPMENT

### 4.1 Telephone Set Type: Minimum Capabilities, Requirements

#### A. Executive/Administrative offices

1. Six (6) Physical Lighted Line Appearance keys
2. Two way Speaker Phone
3. Support for expansion module with additional line keys
4. 802.3af Power Over Ethernet (PoE) support.
5. Integrated 10/100 switch.

#### B. Classroom / Shared Spaces

1. Two (2) Physical Lighted Line Appearance keys
2. Two way Speaker Phone
3. 802.3 af Power Over Ethernet (PoE) support.
4. Integrated 10/100 switch.

#### C. Public areas / Miscellaneous Spaces

1. 1 line (May use 0 line keys)
2. 802.3 af Power Over Ethernet (PoE) support.

#### D. Conference Rooms / Conference Phones

1. Support for external microphone kit
2. 802.3 af Power Over Ethernet PoE support.
3. Door Phone / Push button Intercom
4. Door Intercom w/ doorstrike release
5. Vandal resistant / Hardened
6. Phone system integrated

### 4.2 Elevator Intercommunication System

- A. Elevator car stations shall have an auto-dialer and a time-clock switch programmable to dial primary and secondary numbers.
- B. Connect the automatic dialing, hands-free station in the elevator car to a dedicated telephone line. The elevator car station shall automatically dial a programmed number to alert the school personnel that there is a problem in the elevator and identify visually which elevator is initiating the call.
- C. The primary number shall ring in the General Office, while the secondary number shall ring the elevator installer. Dedicated phone lines (not through the Private Branch Exchange (PBX)) shall be provided for the Elevator Intercommunication System
- D. Provide a telephone set within Elevator Machine Rooms, as part of school telephone system.

END OF SECTION 272000



## SECTION 272100 – DATA COMMUNICATIONS NETWORK EQUIPMENT

### PART 1 - GENERAL GUIDELINES

#### 1.1 GENERAL

- A. This Section defines the general design requirements for a uniform Data Communications Network Infrastructure

#### 1.2 SECTION INCLUDES

##### A. DATA COMMUNICATIONS NETWORK EQUIPMENT

1. File/Building Server – optional.
2. Network Switches.
3. Network Core Switch.
4. Network Security Equipment.
5. Uninterruptible Power Supplies (UPSs).

#### 1.3 QUALITY ASSURANCE

- A. All equipment shall be UL listed.
- B. All equipment and Installation Practices shall comply with the latest @BICSI Telecommunications Distribution Methods Manual (TDMM).

#### 1.4 SYSTEM WARRANTY

- A. The Local Area Network Electronics and software shall be fully warranted for three (3) years from date of substantial completion by the contractor and manufacturer. If any defects are found within this warranty period, the defective system component shall be replaced at no extra cost to the Authority for parts or labor. Provide a statement of this warranty with the O&M manuals and to the Director of IT. Make available a service contract offering continuing factory authorized service of this system after the initial warranty period.

#### 1.5 GENERAL

- A. Each Building shall be provided with a Local Area Network (LAN) System.
- B. Existing Facilities that are being remodeled shall be upgraded to the current requirements stated herein.
- C. Single Building projects shall be compatible with the existing network infrastructure.
- D. Wide Area Network (WAN) Interfaces shall be provided to interface the Authority's WAN provider. Coordinate WAN requirement with the Authority's fiber provider as applicable.
- E. Buildings shall be designed as to minimize the quantity of Telecommunications Rooms and to centralize as much of the Data Network Equipment as possible.
- F. Multiple buildings on the same campus should be designed to share common Data Network Electronics and equipment wherever possible.

- G. The Authority should design their Data Networks to take advantage of Centralization of Common Network Equipment at a Network Operations Center(s).
- H. Items that should be centralized include:
  - 1. File/Building Servers.
  - 2. L-3 Routing Devices.
  - 3. Network Management Equipment.
  - 4. Security Devices, Radius Servers, etc.
  - 5. WAN access equipment.
  - 6. Wireless Management Equipment.
- I. As a minimum, the Network may be used to support the following applications on a Local and Wide Area basis:
  - 1. Automation Systems.
  - 2. Clock Systems.
  - 3. Control Systems.
  - 4. Data Networking
  - 5. Security Systems.
  - 6. Video Conferencing.
  - 7. Video Streaming/Media Retrieval.
  - 8. VoIP Telecommunications.
  - 9. Wireless Access Points.

#### 1.6 FILE/BUILDING SERVER

- A. Provide Network File/Building Server for the central administration and storage of computer files and information. The Networked Server shall be of a current design criteria, utilizing SAS 10k-15k rpm RAID level 5 hard drive storage (minimum 2TB)--Quad core processor. Coordinate OS with the Authority. Min. 64-bit Windows Server 2008 if Windows based. Minimum 16 GB of RAM, 2 x 10Gig NIC. Attach to Core via 10 Gig DAC. 22" LED monitor, rack mounted.
- B. Provide Operating System based on the Authority's requirements.

#### 1.7 NETWORK SWITCHES

- A. Proprietary Specifications:
  - 1. The following product/manufacture has been approved by the Authority for proprietary specifications and use in this project.
    - a. Network Switches: Cisco
  - 2. Subject to compliance with codes and all project requirements, the Contractor is required to use the indicated product/manufacture and to verify compatibility with the existing systems.
- B. Provide 1000 Base T Layer 2 Manageable Ethernet Switches with ports in a quantity to support all initially planned devices, including wireless access points, with 15% spare.
- C. Provide a configuration of switch ports utilizing either stackable edge switches or a modular chassis with single engine and dual PS.

1. Provide dual 10GB uplinks to each switch stack or modular chassis.
- D. The 1000 switches shall be “non-blocking” and support a minimum forwarding bandwidth equal to the number of switch ports x 1 Gbps.
- E. Utilize 10GB uplinks for all uplinks. Switches may be stacked, but provide each stack with a minimum of two uplinks for redundancy.
- F. Chassis mounted units are acceptable for Edge Switches, provided that dual power supplies and equivalent uplink bandwidth is supplied.
- G. The Network switches shall support advanced services such as:
1. IP Telephony.
  2. Wireless Access Points.
  3. Building Management Systems.
  4. Video Streaming.
  5. IP CCTV/Access Control
- H. POE+ switches shall be rated to provide POE+ class 3 on all ports simultaneously. Standard 30 watts per port. Reference 802.3at standard.
- I. The 1000 switches shall support the following features and specifications:
1. 1000BASE-LX/LH.
  2. 1000BASE-SX.
  3. 1000BASE-X (SFP).
  4. 1000BASE-ZX.
  5. Access Control Lists (ACL).
  6. Advanced QoS.
  7. IEEE 802.1s.
  8. IEEE 802.1D Spanning Tree Protocol.
  9. IEEE 802.1p CoS Prioritization.
  10. IEEE 802.1Q VLAN.
  11. IEEE 802.1s.
  12. IEEE 802.1w.
  13. IEEE 802.1x.
  14. IEEE 802.3 10BASE-T specification.
  15. IEEE 802.3ab 1000BASE-T specification.
  16. IEEE 802.3ad.
  17. IEEE 802.3af and 802.11at POE.
  18. IEEE 802.3u 100BASE-TX specification.
  19. IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 1000BASE-T ports.
  20. IEEE 802.3z 1000BASE-X specification.
  21. IPv6.
  22. Rapid Spanning Tree.
  23. Rate Limiting.
  24. RMON I and II standards.
  25. SNMPv1, SNMPv2c, and SNMPv3.
- J. Provide sufficient 1000 ports to accommodate, as a minimum, the following devices as required:
1. Access Control System.

2. Admin PCs.
  3. Classroom PC Devices.
  4. Clock Systems.
  5. Distant Learning Systems.
  6. Instructor PCs.
  7. Monitor/TVs, as required.
  8. MPEG Encoders.
  9. PABX System.
  10. Printers.
  11. Projectors.
  12. Set Top Boxes, as required.
  13. UPS Units.
- K. Provide all GB POE+ ports to accommodate, as a minimum, the following devices as required:
1. IP Phones
  2. IP CCTV Cameras
  3. WLAN access points.
- L. Switches housed in MDF and IDF rooms support 10 Gigabit Ethernet Connectivity between IDF and MDF rooms. 1-Gigabit Ethernet Connectivity to each station drop.

## 1.8 NETWORK CORE SWITCH

- A. Provide a modular chassis-based central Layer-3 ethernet routing switch with advanced QoS to serve the entire building or campus. The Core switch shall be provided with backplane capacity to provide full non-blocking support of all installed line cards plus 15% growth.
- B. Equip the Central Layer-3 switch with a minimum of two (2) Power Supplies and two (2) Redundant Central Control/Supervisor Units.
- C. All Core switch Blades must support full line speed and shall not be over-subscribed.
- D. Provide sufficient Ports on the Layer-3 Core Switch, as a minimum, for the following devices:
1. Provide Network Switch uplink ports to support all edge switches plus 15% spare. The switch shall have at least one spare uplink card for redundancy.
  2. Building Automation Systems, as required (typically TX).
  3. CCTV DVR System (typically TX).
  4. File Servers (typically TX, 10GB).
  5. Firewall, as required (typically TX).
  6. Media Distribution Servers & Controllers (typically TX).
  7. Radius Authentication Server, as required, (typically TX).
  8. WAN Connectivity (typically LX or CWDM).
  9. Wireless Controllers (typically TX, 10GB).
  10. Wireless Phone Controller (typically TX).
  11. Wireless Control Console (typically TX).
- E. In addition to the above listed features and specifications for the Network Switches, the Network Core Switch shall support the following Features and Specifications:

1. 10 Gbps Support capabilities.
2. BGP4 and Multicast Border Gateway Protocol (MBGP).
3. Full Internet Control Message Protocol (ICMP) support.
4. Hot Standby Router Protocol (HSRP).
5. ICMP Router Discovery Protocol.
6. IGMP filtering.
7. IGMP v1, v2, and v3.
8. IP Multicast routing protocols.
9. IP routing protocols: EIGRP, OSPF, Routing Information Protocol (RIP), and RIP2.
10. Non-Blocking GBE Ports.
11. NSF awareness.
12. Policy-based routing (PBR).
13. Virtual Router Redundancy Protocol (VRRP).

## 1.9 NETWORK SECURITY EQUIPMENT

### A. RADIUS SERVER

1. If the Authority does not have a Central Radius Server, provide a Radius Server for Network Authentication, VLAN Assignment and Policy Assignment for IP Network Attached Devices.

### B. FIRE WALL

1. If the Authority does not have a Central Firewall and Intrusion Detection Device for connection to the Wide Area Network and Internet, provide a Firewall and Intrusion Detection Device for Protection and Security. Establish all Internet Connections via a Firewall.
2. Size the Firewall based on planned Network throughput, available WAN bandwidth and attached IP Devices.
3. Provide VPN services in the Firewall for remote access and network maintenance services.
4. Coordinate requirements with the Authority's Technology Department.

## 1.10 UNINTERRUPTIBLE POWER SUPPLIES (UPSs)

- A. Provide Dual Conversion UPS units for ER and TR Local area Network Electronics and File Server, providing sufficient protection from power anomalies.
- B. Provide Power strips, connected to the UPS Unit via twist-lock plugs. Locate the power strips in the equipment racks and on the equipment backboards for powering all electronics systems in the ER and TRs.
- C. Provide multiple UPS Units based on expected power load or a single large UPS Unit. Locate the multiple UPS units in the associated equipment racks or locate a larger central UPS unit in the Room.
- D. Connect the UPS Units to Building Emergency Generator when available.
- E. For buildings without a Generator, supply a two-hour (2) standby.
- F. Provide shutdown connections from the UPS to servers for graceful power down in the

event of a power failure.

- G. Equip the UPS Units with a twist-Lock Power cable and SNMP Management Card.
- H. Connect the UPS SNMP Management to the ManagementVLAN.
- I. Coordinate UPS voltage, circuit size, and connection requirements with the Electrical Design Professional.

#### 1.11 INSTALLATION

- A. Install File Server (optional) and setup basic user accounts and network configuration.
- B. Install Data Network Ethernet Switches and validate connectivity throughout. Establish all VLANs, QoS, IP Routing and IPSubnets.
- C. Consult with the Authority and consider providing the following VLANs as a minimum:
  - 1. Administration.
  - 2. HVAC.
  - 3. Management.
  - 4. Point of Sale.
  - 5. Student.
  - 6. Video.
  - 7. Voice.
  - 8. Wireless.
  - 9. Security, CCTV
- D. Coordinate network installation and integration with other systems connected to the network with the Authority's and applicable DA-Site's technical and operational requirements.
- E. Install and setup UPS units and establish power down procedures.

#### 1.12 LABELING AND MARKING

- A. Provide a typed schedule of all data ports according to each related room jack designation for all TRs, and ER, in accordance with the Authority's requirements.

#### 1.13 TESTING

- A. Test the system "end-to-end" (from TR to ER, and from TR to station jack) at the direction of the Design Professional and verify, in writing, that the data network system is in proper working condition.
- B. Verify and demonstrate proper operation of all switches, Access Points, VLANs, Routing, WAN Connectivity and possible ATM Connectivity with the Authority's and DA-Site representative, if applicable.

#### 1.14 TRAINING

- A. Provide a minimum of forty (40) hours of training to the Authority's personnel. Plan for multiple training trips to the site. Training session(s) shall cover the following topics at a minimum:

1. System Equipment Connectivity
  2. Device Configurations
  3. Operation, maintenance, and upgrade procedures.
- 
- B. Training to be arranged with Authority personnel. 40 hours should be spread out over the length of the warranty (Ex: 8 hours at project turnover/completion, 8 hours at 3 months, 8 hours at 6 months, 8 hours at 1 year, 4 hours at 2 years, 4 hours at 3 year).
  - C. Training to occur in maximum of 2 hour increments per personnel or groups of personnel.
  - D. Consider requiring Contractor to provide manufacturer training vouchers for a portion of the training, which are valid during the warranty period.
  - E. Training shall be by certified manufacturer instructor.
  - F. Training schedule shall be coordinated with Authority personnel and their needs.
  - G. Training plan, time line, and agenda shall be provided to Authority IT personnel and signed off by the Authority and Contractor.
  - H. Warranty certificate and agreement shall be provided to Authority IT personnel at initial training session.
  - I. Provide a digital video copy of the training sessions.

END OF SECTION 272100



## SECTION 272102 – DATA SYSTEMS

### 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.
- B. Work include in this section shall have one system integrator to coordinate with the following specification sections.
  - 1. 27 05 34 RACEWAYS, BOXES, AND CABINETS
  - 2. 27 05 36 CABLE TRAY FOR COMMUNICATIONS

#### 1.02 SUMMARY

- A. This Section includes the cable, network switches, connecting devices, wireless access points, patch panels, installation, and testing for wiring systems to be used as signal pathways for video and high-speed data transmission.
- B. One system integrator shall oversee all installations related to this specification and related documents listed in part 1.1.

#### 1.03 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each component specified, including detailed manufacturer's specifications. Include data on features, ratings, and performance. Include dimensioned plan and elevation views of components. Show access and working-space requirements.
- C. Samples of Data outlet connectors, jacks, jack assemblies, and faceplates and evaluation of technical features.
- D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Provide evidence of applicable registration or certification.
- E. Field test and observation reports indicating and interpreting test results relative to compliance with performance requirements of the installed systems.
- F. Maintenance data for products to include in the operation and maintenance manual.
- G. Final Documentation as specified in Part 3.
- H. Evidence of listing of products specified to be listed in the "Quality Assurance" Article.
- I. Shop Drawings:

1. Provide (3) sets of documents on cable certification results and AutoCAD files indicating cable location, labels and all connections.
- J. Extra Materials: Submit one month prior to date of Substantial Completion.
- K. Provide certification for Owner's maintenance personnel as verification of training.

#### 1.04 QUALITY ASSURANCE

- A. Installing Firm Must Be A Qualified Cabling Contractor With At Least Five Years Experience In The Installation, Testing And Adjustment Of Systems Similar To The System Specified Herein.
- B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
  1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
  2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- C. Work Coordination: Coordinate Work of this Section with Owner's telephone switch, telephone instrument, workstation, local area network (LAN), and wide area network (WAN) equipment suppliers. Coordinate the service entrance arrangement with the local exchange carrier.
  1. Meet jointly with representatives of the above organizations and Owner's representatives to exchange information and agree on details of equipment arrangements and installation interfaces.
  2. Record agreements reached in meetings and distribute record to other participants.
  3. Adjust the arrangements and locations of distribution frames and patch panels in equipment rooms and wiring closets to accommodate and optimize the arrangement and space requirements of the telephone switch, LAN and WAN equipment.

#### 1.05 WARRANTY

- A. Fifteen (15) year manufacturer's product warranty and 15-year performance warranty for all wiring system components, in writing directly from the manufacturer to the customer, and copied to the engineer. The performance warranty shall warrant the installed cabling system including data cables and fiber optic cables. Copper links shall be warranted against the link performance minimum expected results defined in TIA/EIA 568, tsb-67. Fiber optic links shall be warranted against the link and segment performance minimum expected results defined in the TIA/EIA 568, Annex h.

#### 1.06 STANDARDS

- A. All data and video cabling work must comply with federal, state and local codes. Any code or requirement found to be more stringent than in these contract documents shall take precedence over the contract documents, and will become a contract requirement. Contractor must identify and report any deviations being considered from the following standards:

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ELECTRONIC INDUSTRIES ASSOCIATION (EIA)

Mount Pleasant CSD/Physical  
Education Department Renovations  
at Westlake High School  
NYSed #66-08-01-06-0-005-020

272102-2

#4.1449.08

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA):

EIA/TIA-568 -- COMMERCIAL BUILDING CABLING STANDARDS AND IEEE 802.3X.

EIA/TIA-569-- COMMERCIAL BUILDING STANDARDS FOR TELECOMMUNICATIONS PATHWAYS AND SPACES.

EIA-TSB36—(TECHNICAL SYSTEMS BULLETIN 36) FOR CABLE SPECIFICATIONS.

EIA/TIA-TSB 67-TECHNICAL SYSTEMS BULLETIN 67)-- TESTING STANDARDS.

EIA/TIA-TSB 72—(TECHNICAL SYSTEMS BULLETIN 72)--CENTRALIZED OPTICAL FIBER CABLING.

EIA/TIA-TSB 75—(TECHNICAL SYSTEMS BULLETIN 75)--OPEN OFFICE CABLING.

EIA/TIA-606 ADMINISTRATION STANDARDS FOR TELECOMMUNICATIONS INFRASTRUCTURE.

EIA/TIA-607—COMMERCIAL BUILDING GROUNDING AND BONDING REQUIREMENTS FOR

TELECOMMUNICATIONS.

EIA/TIA-TSB40A (TECHNICAL SYSTEMS BULLETIN 40A)-- ADDITIONAL TRANSMISSION SPECIFICATIONS FOR UNSHIELDED, TWISTED-PAIR CONNECTING HARDWARE.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA).

NFPA NUMBER 70.

NFPA ARTICLE 725-- REMOTE CONTROL, SIGNALING AND POWER-LIMITED CIRCUITS.

NFPA ARTICLE 800-- COMMUNICATIONS CIRCUITS.

NFPA ARTICLE 770—OPTICAL FIBER CABLES.

UNDERWRITERS LABORATORIES INC (UL).

UL 910—TEST METHOD FOR FIRE AND SMOKE CHARACTERISTICS OF ELECTRICAL AND OPTICAL-FIBER CABLE.

#### 1.07 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

1. Data Cable: 1000 feet size and type used for Project. Furnish on reels.
2. Patch Cords: (10) of each type and length used for Project.
3. Station Cables: (10) of each length used for Project.
4. Connecting Blocks: 1 of each type for each 100 installed, but not less than 1.

5. Faceplate./Jack Assemblies: (10) of each type for each 100 installed, but not less than 1.

## 1.08 DELIVERY, STORAGE AND HANDLING

### A. Fiber Optical Cable Delivery:

1. No cable over one year old when delivered to the site will be accepted.
2. Keep ends of cables sealed at all times, except when making splices or terminations. Use methods approved by cable manufacturer.
3. Include the following data durably marked on each reel:
  - a. Facility name and address.
  - b. Contractor's name.
  - c. Project title and number.
  - d. Date of manufacture.
  - e. Manufacturer's name.
  - f. Linear feet.

- ### B. Cable Storage: Store where cable will be at temperature recommended by cable manufacturer for optimum workability.

## 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. Cable:
  - a. Mohawk/CDT.
  - b. Commscope.
  - c. Belden
  - d. Amp
  - e. Cisco
  - f. Or approved equal
2. Connecting Devices:
  - a. Leviton
  - b. Krone
  - c. Amp
  - d. Cornell
  - e. Or approved equal

### 2.02 SYSTEM REQUIREMENTS

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- A. General: Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance.
- B. Expansion Capability: Unless otherwise indicated, quantity of spare conductor pairs in cables, positions in patch panels, cross connects, spare room in equipment racks and terminal strips shall be adequate to accommodate a 10 percent future increase in active workstations.
- C. Installer shall determine the quantities of station runs, distribution (backbone) runs, patch panels and all necessary equipment to install data system.

## 2.03 WIRING PATHWAY AND EQUIPMENT MOUNTING ELEMENTS

- A. Distribution IDF Cabinets: Cabinet: Provide lockable, floor-mounted steel units designed for telecommunications terminal and equipment support and coordinated with dimensions of the units to be supported.
  - 1. Each wiring closet is to have adequate quantities of floor standing equipment racks to house patch panels, fiber housings, wire management, data switching equipment and expansion capability. Minimum requirements (2) cabinets for MDF-1, (1) cabinet for IDF-2 and (1) cabinet for IDF-3.
  - 2. Placement of the racks must adhere to applicable EIA/TIA standards for equipment room layout. If conflicts exist between field conditions and standards requirements, then it is the responsibility of the cabling contractor to bring this situation to the attention of the Owner and the engineer. Final locations shall be determined by Owner.
  - 3. Black, baked-polyester powder coat finish with smoked plexi-glass front with lock and (2) top mounted powered fans.
  - 4. Power strip with 10 surge protected outlets.
  - 5. Approximate Dimensions: 84 inches high by 22 inches wide (2130 mm high by 560 mm wide) overall. (For standard 19" wide rack mounted equipment).
- B. Wire Management
  - 1. Double sided horizontal wire management is to be installed above, between and below each patch panel and fiber housing.
  - 2. Top and bottom position wire managers are to be 1.5 inches
  - 3. Wire managers installed in between patch panels are to be 3.0 inches.
  - 4. Double sided, vertical wire management is to be installed down one side of each equipment rack. If multiple equipment racks will be located together in the same wiring closet, then vertical wire managers should be center-mounting type.
  - 5. For Vertical Wire Managers, Minimum Channel Size For Each Channel (Front And Back) Is To Be 4 X4 Inches.

## 2.04 DATA CABLES, CONNECTORS, AND TERMINAL EQUIPMENT

- A. Listed as Complying with Category 6 of EIA/TIA-568: Provide evidence of listing for all products specified in this Article.

- B. Data cables shall be 24 awg, (4) pair, unshielded twisted pair (utp) Category 6 (400mhz) cable. The cable sheath is to be blue in color for identification purposes, and labeled to reflect its Category 6 (400mhz) rating. Cable is to meet or exceed the Category 6 (400mhz) rating and be plenum rated.
- C. Wireless Access Data cables shall be 24 awg, (4) pair, unshielded twisted pair (utp) Category 6 (400mhz) cable. The cable sheath is to be yellow in color for identification purposes, and labeled to reflect its Category 6 (400mhz) rating. Cable is to meet or exceed the Category 6 (400mhz) rating and be plenum rated.
- D. Security Data cables shall be 24 awg, (4) pair, unshielded twisted pair (utp) Category 6 (400mhz) cable. The cable sheath is to be green in color for identification purposes, and labeled to reflect its Category 6 (400mhz) rating. Cable is to meet or exceed the Category 6 (400mhz) rating and be plenum rated.
- E. Patch Panels
  - 1. Patch panels are to be 48 port and 96 port, Category 6 utilizing EIA/TIA 568-B terminations.
  - 2. Panels are to be rack mounted with black anodized faceplates.
  - 3. Patch panels shall have 110 style connectors for the termination of station wiring.
  - 4. If A Patch Panel Port Is Not Functional, Or Cannot Pass Certification Testing, Then It shall be replaced Or The Entire Patch Panel.
- F. Face Plates and inserts
  - 1. Data Station faceplates shall be single gang and provide single, two, four, or six ports, dependant on the number of cables at the drop location. Faceplates are to house modular RJ-45 inserts as required.
  - 2. Data modular inserts shall be Category 6 and be flush mounted in faceplate. Terminating Procedures Must Strictly Adhere To The Eia/Tia 568-B Wiring Code.
  - 3. Faceplates shall have ample room to accommodate labeling as detailed further in this specification. Blanks shall be installed in all unused ports.
  - 4. All faceplates shall be compatible with floor boxes.
- G. Patch Cords: Red Category 6 patch cables in 24 and 36-inch lengths. Provide one for each patch panel port in the following quantities- 50% at 24 inch and 50% at 36 inch.
- H. Station Cables (for connecting computers & printers) : Provide one Blue Category 6 cable for each patch panel port in the following quantities- 25% at 5 foot, 25% at 10 foot, 25% at 15 foot and 25% at 25 foot.

## 2.05 FIBER OPTIC CABLE CONNECTORS AND EQUIPMENT

- A. Fiber Optic Connectors: Connectors shall be "ST" type, with epoxy-less crimp and ceramic ferrule . Connectors must be compatible with fiber optic cable used on the project. DB loss shall not exceed manufacturer's specified maximum loss per connector.
  - 1. Breakout kits shall be used for all "Loosetube" cables.

- B. Fiber Optic Distribution Panels: Panels shall be compatible with a 19" equipment rack and consist of an enclosure fitted with ST style multimode adapter plates for all fiber strands. Each panel shall provide 24 ports.
- C. Fiber Optic Termination Cabinet (FTC)
  - 1. 16 gauge steel enclosure with lock by Corning or equal.
  - 2. Adapter plate with factory mounted ST type multimode feed-thru adapters (number of adapters as required).
- D. Fiber Patch Cords:
  - 1. Duplex 50 micron/125 micron (core/clad) multimode optical fibers, with a UL rating of OFNR. Optical performance and manufacturer to be the same as specified for fiber optic cable.
  - 2. PVC outer jacket.
  - 3. Cable length of 1 meter.
  - 4. Connectors: Cables shall utilize dual ST-style to SC-style factory-terminated connectors.
  - 5. Quantity equal to the number of fiber connections in each wiring closet, plus one additional cable per closet.
- E. Fiber Optic Labels:
  - 1. One label shall be securely fastened to innerduct or fiber optic cable at all pull boxes, manholes, termination points and splice points.
  - 2. Labels shall be plastic laminate with engraved letters of 1/4 inch minimum. Labels shall contain fiber type, size and destination.
  - 3. Each fiber strand and ST connector shall be labeled with a printed label corresponding to an identical label at opposite end.

## 2.06 IDENTIFICATION PRODUCTS

- A. Cable Labels: Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.

## 2.07 INSTALLATION PRODUCTS

- A. Cable Hooks: Steel hooks designed for support of cables; Arlington Industries "CH1M" series, or equal. Provide beam clamps, rods, or other hardware as needed to attach cable hooks to building structure.
- B. Sleeves: Provide at least one steel conduit sleeve (minimum size 1.5"), with plastic bushings on each end of conduit from each/every room where there are data and/or video drops. Sleeve shall run from room into hallway to allow for the routing of cabling to nearest data closet. Sleeve shall be installed above accessible ceilings and be placed to avoid mechanical, electric and plumbing work. Provide additional sleeves as required to accommodate number of cables.

## PART 3 - EXECUTION

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### 3.01 EXAMINATION

- A. Examine pathway elements to receive cable. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

- A. Wiring Method: Install cables in raceway system in all areas where cable will be exposed. In slab installation, cable is to be installed in PVC. Install pull string in raceways with wiring. Conceal cables except in unfinished spaces and within data closets. In locations with accessible ceilings, cables may be bundled and run above the ceiling supported on cable hooks .
- B. Back boxes: plastic insert boxes or insert rings with pressure mounts are not acceptable attachments. All cables terminated on wall plates should be contained within a metal electrical box
- C. Cable Routing shall be via the shortest route, and shall be as per EIA/TIA 568 Standards. Routing is to be determined by the Cabling Contactor unless otherwise indicated .
- D. Install cable without damaging conductors, shield, or jacket.
- E. Do not bend cable in handling or installation to smaller radii than minimums recommended by manufacturers.
- F. Pull cables without exceeding cable manufacturer's recommended pulling tensions.
  - 1. Pull cables simultaneously where more than one is being installed in the same raceway.
  - 2. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage media or raceway.
- G. Install exposed cable parallel and perpendicular to surfaces or exposed structural members, and follow surface contours where possible.
- H. Secure and support cable not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
- I. Wiring within data closets and Enclosures: Provide adequate length of conductors. Train the conductors to terminal points with no excess. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to radii smaller than allowed.
- J. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
- K. Provide conduit sleeves with protective bushing on ends required for routing of cables.

### 3.03 DATA CABLE INSTALLATION

- A. All voice and data cables are to be terminated . Pair twist must be maintained to within .5 inch of termination point.
- B. Install components as indicated, according to manufacturers' written instructions. Use techniques, practices, and methods that are consistent with EIA/TIA 568 standards.

- C. All data outlets shall be cabled with individual 4-pair cable with unbroken return to punch down on back of patch panels in closets.
  - 1. No splicing of cable will be allowed.
- D. All horizontal data cables shall be independently supported of building structure above suspended ceilings, tunnels, etc. The use of "j" hooks or equivalent hangers are required.
  - 1. Cable supports or hangers shall be placed at a minimum of 3 ½ foot intervals, or closer, to prevent sagging. Install hangers so that all cable is run in the same horizontal plane without rises and falls that cause radiuses in the cable.
  - 2. Cables shall be bundled in groups of not greater than 40 cables in order to insure that bottom cables are not deformed.
- E. Separation of Wires: Comply with EIA/TIA-569 rules for separation of unshielded copper data system cables from potential EMI sources, including electrical power lines and equipment.
  - 1. All telecommunications cabling should be separated from a/c power cables by a minimum distance of 12".
- F. Provide 3 feet of cable Slack On The Wiring Closet Side Of The Cables To Allow For Adjustment Of Rack And Patch Panel Positions.

#### 3.04 FIBER OPTIC CABLE INSTALLATION

- A. All fiber optic cable must be installed with orange innerduct. Manufacturer's recommendations for maximum pulling tension and bend radius shall be observed. Cable lubricant shall be applied to all pulls through innerduct.
- B. All fiber optic cables must be continuous between distribution frames; no splices will be allowed.
- C. Fiber optic cables passing through pull boxes and manholes shall have a service loop of not less than once the inside perimeter of pull box or manhole. Loops shall be inclusive of innerduct.
- D. A service loop of no less than 20 ft. shall be fastened to building structure, in a secure location, at all termination points.
- E. All Fiber Optic Cable Strands Are To Be Terminated.

#### 3.05 GROUNDING

- A. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common mode returns, noise pickup, cross talk, and other impairments.
- B. Bond shields and drain conductors to ground at only one point in each circuit.
- C. Signal Ground Terminal: Locate at each equipment room and wiring closet. Isolate from power system and equipment grounding.
- D. Install grounding electrodes of type, size, location, and quantity as indicated. Comply with installation requirements of Division 26 Section "Grounding."
- E. Signal Ground Bus: Mount on wall of main equipment room with stand-off insulators.

- F. Signal Ground Backbone Cable: Extend from signal ground bus to signal ground terminal in each wiring closet and equipment room.

### 3.06 INSTALLATION AT MDF/ IDF

- A. Mount patch panels, network switches, terminal strips, UPS units, Fiber Termination cabinets and other connecting hardware in racks, except as otherwise indicated.
- B. Group connecting hardware for cables into separate logical fields.
- C. Provide fiber connectivity to owners existing MDF racks and any associated equipment to complete connectivity.

### 3.07 LABELING

- A. Labeling shall conform to ANSI/TIA/EIA-606 standards. In addition, provide the following:
- B. Label each outlet with permanent self-adhesive label with minimum 3/16 in. high characters.
- C. Label each cable with permanent self-adhesive label with minimum, 1/8 in. high characters, in the following locations:
  - 1. Inside receptacle box at the work area.
  - 2. Behind the communication closet patch panel or punch block.
- D. Use labels on face of data patch panels. Provide facility assignment records in a protective cover at each telecommunications closet location that is specific to the facilities terminated therein.
- E. Use color-coded labels for each termination field that conforms to ANSI/TIA/EIA-606 standard color codes for termination blocks.
- F. Labels shall be machine-printed. Hand-lettered labels shall not be acceptable.
- G. Label cables, outlets and patch panels with prefix (D=Data and V=Video) and room number in which outlet is located, followed by a single letter suffix to indicate particular outlet within room, i.e., D107A, D107B, V107. Indicate riser cables by an R then pair or cable number.
- H. Fiber optic labels shall be securely fastened to innerduct and fiber optic cables at all pullboxes, manholes, termination points and splice points.
- I. Fiber optic labels shall be plastic laminate with engraved letters of ¼ inch minimum. Labels shall contain fiber type, size and destination.
- J. Each fiber strand and ST connector shall be labeled with a printed label corresponding to an identical label at opposite end.
- K. Mark up floor plans showing outlet locations, type, and cable marking of cables. Turn these drawings over to the owner two (2) weeks prior to move in to allow the owner's personnel to connect and test owner-provided equipment in a timely fashion. Obtain floor plans from Architect.
- L. Three (3) sets of as-built drawing shall be delivered to the owner within four (4) weeks of acceptance of project by the owner. A set of as-built drawings shall be provided to the owner in compact disc media form and utilizing CAD software that is acceptable to the owner. The compact disc media shall be delivered to the owner within six (6) weeks of acceptance of project by owner.

### 3.08 TESTING

#### A. Copper (UTP) Testing:

1. Testing of all data cabling shall be performed prior to system cutover. 100 percent of the horizontal and riser wiring pairs shall be tested for opens, shorts, polarity reversals, transposition and presence of AC voltage. Horizontal data cabling pairs shall be tested from the information outlet to the corresponding IDF point of termination.
2. Data cable runs shall be tested for conformance to the specifications of EIA/TIA 568B Category 6.
3. Test Equipment shall comply with TIA/EIA TSB-67 for level II, TIA/EIATSB-95 for Level IIE, and TIA/EIA 568A Level III Accuracy at basic link.
4. All Data Cables (And All Pairs) Shall Be Tested From Patch Panel to Jack and must measure network-specific channel response to provide accurate pass/fail for all major LAN networking standards.
5. Must be able to provide graphic reports with printouts of full plot data.
6. Complete, end to end test results must be submitted to the owner.

#### B. Optical Fiber Cable Testing:

1. Each fiber strand, including spare strands, shall be Optical Time Domain Reflectometer (OTDR) tested. Detailed testing specifications will be available after the bid award.
2. The OTDR used shall be equipped with suitable launch cables. The OTDR traces will accurately display dB loss per division and magnify to the largest scale possible, zooming in on the trace being monitored. The raw information that is gathered shall be compiled and displayed in a simple and useable manner. Test results shall be stored on a disk. Hard copy, printed results showing bandwidth (design) and dB loss shall be submitted with documentation package.
3. Horizontal Link Measurement
  - a. The horizontal link should be tested at 850 nm or 1300 nm in one direction in accordance with ANSI/EIA/TIA-526-14A, Method B, One Reference Jumper. The attenuation results should be less than 2.0 dB. This value is based on the loss of two (2) connector pairs, one (1) pair at the telecommunications outlet/connector and one (1) pair at the horizontal cross-connect, plus 90 m (295 ft) of optical fiber cable.
4. Backbone Link Measurement
  - a. The backbone optical fiber link segment will be tested in one direction at BOTH operating wavelengths to account for attenuation deltas associated with wavelength. Single-mode backbone links will be tested at 1310 nm and 1550 nm in accordance with ANSI/EIA/TIA-526-7, Method A.1, One Reference Jumper. 50/125 um backbone links will be tested at 850 nm and 1300 nm in accordance with ANSI/EIA/TIA -526-14A, Method A.1, One Reference Jumper.
5. Cables must pass all tests, for all stands, or shall be repaired or replaced.

#### C. Pre-installation Cable Testing:

1. The Contractor shall test all lightguide cable prior to the installation of the cable.

2. The Contractor shall assume all liability for the replacement of the cable should it be found defective at a later date.

### 3.09 FIELD QUALITY CONTROL

- A. Employ job superintendent, certified manufacturer of network switches and project manager during the course of the installation to provide coordination of work of this specification and of other related specifications, and provide technical information when requested by owner.

### 3.010 DOCUMENTATION

- A. Submit project record drawings at conclusion of the project and include:
  1. Approved shop drawings.
  2. Plan drawings indicating locations and identification of work area outlets, nodes, IDF and backbone (riser) cable runs.
  3. Cross-connect schedules including entrance point, main cross-connects, intermediate cross-connects, and horizontal cross-connects.
  4. Labeling and administration documentation.
  5. Warranty documents for equipment.
  6. Copper certification test result printouts and loaded onto a USB thumb drive.
  7. Optical fiber power meter/light source test results.
  8. Operation and maintenance manuals

### 3.011 CLEANING

- A. On completion of system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

### 3.012 TRAINING

- A. The contractor shall provide one (1) man for one (1) week (40 hours) at school beginning with the first scheduled move-in date. This technician will also assist the owner in cross connecting the security, VoIP Telephone, IP CCTV and data services throughout the buildings during the move-in period. It is at this time that all owners provided connectivity schedules for voice and data services will be provided to the contractor. Patching (cross connection) of the station assignments between the owners service demarc shall also be considered part of this contractors work.

END OF SECTION 272102

## SECTION 276600 – COMMUNICATIONS EQUIPMENT ROOMS AND FITTINGS

### PART 1 – GENERAL

#### 1.1 WORK INCLUDED

- A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents.
- B. Telecommunications Rooms (MDF/IDF) are generally considered to be floor serving facilities. Horizontal Cross-connects link the Horizontal cable and the Backbone Cable together. The Horizontal Cross-connects shall consist of rack or wall mounted wiring blocks or panels for termination of copper cables or rack or wall mount interconnect termination units or fiber management panels/trays for the termination of optical fibers. Cross-connect spaces include the labeling of hardware for providing circuit identification and patch cords or cross-connect wire used for creating circuit connections at the cross-connect.

#### 1.2 SCOPE

- A. This section includes the minimum requirements for equipment, termination hardware and cable installations in communication equipment rooms.
- B. The telecommunications room shall be equipped to contain telecommunications equipment, cable terminations, and associated cross-connects.
- C. Minimum composition requirements and installation methods for the following:
  - 1. Floor Mounted Relay Racks
  - 2. Wall Mounted Relay Racks and Brackets
  - 3. Floor Mounted Cabinets
  - 4. Cable Management Hardware
  - 5. Cable Ladder Rack (Provided by Electrical Contractor)
  - 6. Patch Panels - Category 6 - Voice
  - 7. Patch Panels - Category 6 - Data
  - 8. Fiber optic panels - Wall Mount Box
  - 9. Fiber optic panels - rack mount (low fiber count)
  - 10. Fiber optic panels/frames- rack mount (moderate fiber count)
  - 11. Fiber optic frames - rack mount (high fiber count)
  - 12. Fiber optic trays - rack mount
  - 13. Back Boards
  - 14. 66 System Blocks
  - 15. Cross Connect Wire
  - 16. Power Strips
  - 17. Optical Fiber Patch Cords
  - 18. Patch Cords - UTP Category 6 - Voice
  - 19. Patch Cords - UTP Category 6 - Data
  - 20. 66 System Patch Cords - Category 6 – Voice
  - 22. Uninterruptable Power Supplies (UPS)

#### 1.3 QUALITY ASSURANCE

- A. All equipment rooms shall be installed in a neat and workmanlike manner.

- B. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Authority's representative.
- C. Equipment and materials shall be of the quality and Manufacturer indicated.
- D. The equipment specified is based on the acceptable manufacturers listed.
- E. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified, and subject to approval.
- F. Separation from sources of EMI shall be as specified in section.
- G. Communication grounding/earthing and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC 1000-5-2, ANSI/TIA/EIA-607, or both be observed throughout the entire cabling system.
- H. Materials and work specified herein shall comply with the applicable requirements of:
  - 1. EIA/TIA-568-A.
  - 2. EIA/TIA-569-A
  - 3. EIA/TIA-606
  - 4. EIA/TIA-607
  - 5. Underwriters Laboratory
  - 6. Federal Communications Commission (including CFR 47 and Part 68 - subpart F)
  - 7. National Electric Code
  - 8. Local and State Codes
  - 9. ISO/IEC 11801
  - 10. IEC 1000-5-2
  - 11. CSA C22.2
  - 12. IEC 60603-7
- I. Manufacturers shall be ISO 9001 Certified, for all components that are required to have submittals provided as part of this section.

## PART 2 – PRODUCTS

### 2.1 FLOOR MOUNTED RELAY RACKS

- A. Racks shall meet the following physical specifications:
  - 1. 19" rack mounting space.
  - 2. 7 foot high.
  - 3. Lightweight, high strength aluminum construction.
  - 4. Black powder coat finish.
  - 5. 15" deep base with four (4) 3/4" bolt down holes.
  - 6. EIA Channel width of 3.0", with #12-24 screw holes
- B. Rack shall have double sided 12/24 tapped holes and EIA universal rack 5/8" to 5/8"- 1/2" standard hole pattern (compatible with 1 1/4" – 1/2" hole patterns)

## 2.2 WALL MOUNTED RELAY RACKS

- A. Wall Mounted Relay Racks shall be provided in locations designated on the drawings and shall meet the following physical specifications:
  - 1. 19" EIA rack mounting space.
  - 2. 48" high with 24 mounting spaces.
  - 3. Lightweight, high strength steel construction.
  - 4. Black powder coat finish.
  - 5. Stationary mounting with 21" deep, 14 gauge mounting brackets and 100 lb. capacity.
  - 6. Racks shall have double sides EIA universal rack 5/8" to 5/8"- 1/2" standard hole pattern (compatible with 1 1/4" – 1/2" hole patterns)

## 2.3 FLOOR MOUNTED CABINET

- A. Floor mounted cabinets shall meet the following specifications:
  - 1. 16 gauge steel construction
  - 2. Nominal 77"x21"x36"
  - 3. Vented roof
  - 4. Removable side panels.
  - 5. Leveling feet

## 2.4 CABLE MANAGEMENT FOR RELAY RACKS

- A. Cable management shall be black metal with integral wire retaining fingers.
- B. Vertical cable management panels shall have front and rear channels.
- C. Vertical cable management panels shall have removable front and back covers, made of black metal.
- D. A horizontal crossover cable manager shall be provided at the top of each relay rack, with a minimum height of 2 rack units each.
- E. A horizontal crossover cable manager shall be provided near the center and at the bottom of each relay rack, with a minimum height of 4 rack units.

## 2.5 LADDER RACK

- A. Provide ladder rack in Telecommunications Room (MDF/IDF) as shown on drawings for horizontal cable support).

## 2.6 PATCH PANELS - CATEGORY 6 – VOICE

- A. The termination panels shall support the appropriate Category 6 applications and facilitate cross-connection and inter-connection using modular patch cords.
- B. Shall be sized to fit an EIA standard, 19-inch relay rack, or be capable of mounting to a wall.
- C. Accommodate at least 24 ports for each rack mount space (1rms = 44.5 mm [1.75 in.]).
- D. Have circuit boards tested in both directions as required by ANSI/TIA/EIA-568-A and ISO/IEC 11801.

- E. Have patented angle left/angle right modules to provide optimum cable management.
- F. Have removable six port modules to allow replacement in the field.
- G. Have Category 6 jacks available in both T568A and T568B wiring schemes, with 66-style termination.
- H. Allow for a minimum of 200 re-terminations without signal degradation below standards compliance limit.
- I. Have modular ports compliant with FCC CFR 47 part 68 subpart F and IEC 60603-7 with 50 micro inches of gold plating over nickel contacts or equivalent.
- J. Allow the use of a 4 or 5-pair 66-style impact termination tool.
- K. Be fully enclosed front and provide rear plastic strips for physical for physical protection of printed circuit board.
- L. Have port identification numbers on both the front and rear of the panel.
- M. Provide clear label holders and white designation labels with the panel, with optional color labels available.
- N. Be made by an ISO 9001 Certified Manufacturer.
- O. ANSI/TIA/EIA-568-A and ISO/IEC 11801 proposed Category 6 compliant.
- P. The following requirements shall also be met (NEXT Loss and FEXT tested in both Differential and Common Mode):

Parameters	Performance @ 100 MHz
NEXT Loss	43.0 dB
FEXT	35.1 dB
Insertion Loss (Attenuation)	.4 dB
Return Loss	20 dB

- Q. Be UL VERIFIED for TIA/EIA Category 6 electrical performance.
- R. Shall be UL Verified for Category 6 compliance and be CSA C22.2 approved.
- S. Be made of a steel frame with black power coat finish 24, 48, and 96 port configurations.
- T. Have mounting slots compatible with ANSI/EIA-310.
- U. Allows the modular insert to accept 66-style patch plugs as a means of termination.
- V. Shall be T-568A Wired.
- W. Provide 48 port panels, unless otherwise noted.
- X. Density must accommodate at least 24 port per single rack unit (1.75" or 44.5mm)

- Y. Paired punch down sequence to allow pair twist within ½” of the termination.
- Z. Shall have port identification numbers on front and rear of the panel.
- AA. Support applications up to 250 MHz
- BB. Have 66 style insulation displacement contacts and termination accomplished with a single conductor impact tool or 4 or 5 pair impact tool.
- CC. Be backwards compatible to allow lower performing categories of cables or connecting hardware to operate to their full capacity.
- DD. Have circuit identification and color-coding designation strips provided with the panel.
- EE. Provide port configurations and densities as called for on drawings.
- FF. Provide rear cable management bar(s) as recommended by the manufacturer.
- GG. Shall be Insulation Displacement Connector 66 style terminations
- HH. Provide EIA/TIA 606 compliant color-coded icons or color-coded designation label strips for all patch panels. Identify voice or data functionality as required
- II. Paired punch down sequence to allow pair twist within ½” of the termination.
- JJ. Provide rear stress relief components as recommended by the manufacturer.
- KK. Acceptable Manufacturers
  - 1. Siemon
  - 2. Hubbell
  - 3. Panduit
  - 4. Or approved equal

2.7 PATCH PANELS - CATEGORY 6 – DATA

- A. The termination panels shall support the appropriate Category 6 applications and facilitate cross-connection and inter-connection using modular patch cords.
- B. Shall be sized to fit an EIA standard, 19-inch relay rack, or be capable of mounting to a wall.
- C. Be made of a steel frame with black power coat finish, in 24, 48, 72 and 96-port configurations.
- D. Accommodate at least 24 ports for each rack mount space (1rms = 44.5 mm [1.75 in.]).
- E. Have circuit boards tested in both directions as required by ANSI/TIA/EIA-568-A and ISO/IEC 11801.
- F. Have patented angle left/angle right modules to provide optimum cable management.
- G. Have removable six port modules to allow replacement in the field.
- H. Support applications up to 250 MHz
- I. Have Category 6 jacks available in both T568A and T568B wiring schemes, with 66-style

termination.

- J. Have 66 style insulation displacement contacts and termination accomplished with a single conductor impact tool or 4 or 5 pair impact tool.
- K. Be backwards compatible to allow lower performing categories of cables or connecting hardware to operate to their full capacity.
- L. Allow for a minimum of 200 re-terminations without signal degradation below standards compliance limit.
- M. Have modular ports compliant with FCC CFR 47 part 68 subpart F and IEC 60603-7 with 50 microinches of gold plating over nickel contacts or equivalent.
- N. Allow the use of a 4 or 5-pair 66-style impact termination tool.
- O. Be fully enclosed front and provide rear plastic strips for physical protection of printed circuit board.
- P. Have port identification numbers on both the front and rear of the panel.
- Q. Provide clear label holders and white designation labels with the panel, with optional color labels available.
- R. Have circuit identification and color-coding designation strips provided with the panel.
- S. Be made by an ISO 9001 Certified Manufacturer.
- T. ANSI/TIA/EIA-568-A and ISO/IEC 11801 proposed Category 6 channel compliant.
- U. The following requirements shall also be met (NEXT Loss and FEXT tested in both Differential and Common Mode):

Parameters	Performance @ 100 MHz
NEXT Loss	43.0 dB
FEXT	35.1 dB
Insertion Loss (Attenuation)	.4 dB
Return Loss	20 dB

- V. Be UL VERIFIED for TIA/EIA Category 6 electrical performance.
  - 1. Shall be UL Verified for Category 6 compliance and be CSA C22.2 approved.
  - 2. Provide EIA/TIA 606 compliant color-coded icons or color-coded designation label strips for all patch panels. Identify voice or data functionality as required.
  - 3. Provide 48 port panels, unless otherwise noted
- Z. Paired punch down sequence to allow pair twist within 1/2" of the termination.
- AA. Shall have port identification numbers on front and rear of the panel.
- BB. Density must accommodate at least 24 port per single rack unit (1.75" or 44.5mm)
- CC. Have mounting slots compatible with ANSI/EIA-310.
- DD. Allows the modular insert to accept 66-style patch plugs as a means of termination.

- EE. Shall be T-568A Wired.
- FF. Provide port configurations and densities as called for on drawings.
- GG. Provide rear cable management bar(s) as recommended by the manufacturer.
- HH. Shall be Insulation Displacement Connector 66 style terminations.
- II. Provide rear stress relief components as recommended by the manufacturer.
- JJ. Be UL verified for TIA/EIA Category 6 electrical performance.
- KK. Acceptable Manufacturers:
  1. Siemon
  2. Hubbell
  3. Panduit
  4. Or approved equal

## 2.8 FIBER OPTIC PANELS - WALL MOUNT BOX

- A. All panels and trays (units) shall provide cross-connect, inter-connect, splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.
- B. The wall mount interconnect center shall:
  1. Be available in 12,24 port termination densities for single door applications
  2. Be available in 12,24 and 48 port termination densities for dual door applications
  3. Accommodate various simplex connectors including ST®, SC, FC and LX.5
  4. Have single or dual hinged doors.
  5. Have the ability to mount the cable clamp on the interior of the panel
  6. Feature adapters which are angled
  7. Have radiused outer edges and be putty white in color
  8. Offer factory termination of the optical cable as an option
  9. Be made by an ISO 9001 certified manufacturer
  10. Provide port configurations and densities as called for on drawings.

## 2.10 FIBER OPTIC PANELS - RACK mount (low fiber count)

- A. All panels and trays (units) shall provide cross-connect, inter-connect, splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.
- B. Shall be available in 12 and 24 port with no splicing.
- C. Be available in 24 port configuration for splicing.
- D. Allow mounting in either 19" or 23" equipment bays.
- E. Allow flush or 5" recess mounting.
- F. Use adapter plates that house 6 adapters each.
- G. Have adapters angled to the left and right of the panel.

- H. Be available in black.
- I. Be made by an ISO 9001 certified manufacturer.
- J. Shall meet or exceed all TSB-72 requirements.
- K. Provide port configurations and densities as called for on drawings.
- L. Shall be wall or rack mountable.
- M. Shall have a hinged removable front cover.
- N. Shall feature a front access design with a hinged bulkhead plate.
- O. Shall house 6 adapters per adapter plate.

#### 2.11 FIBER OPTIC PANELS/FRAMES - RACK MOUNT (MODERATE FIBER COUNT)

- A. All panels and trays (units) shall provide cross-connect, inter-connect, splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.
- B. Shall be available in 12, 24, 48, 72 and 96 port configurations.
- C. Feature a front access design with hinged bulkhead plate.
- D. Use adapter plates that house 6 adapters each.
- E. Have a hinged removable front cover.
- F. Have adapters that are angled to the left of the panel.
- G. Have an integrated vertical cableway on one side of the panel.
- H. Be mountable in flush, 1"2" and 5" recess options.
- I. Be 19" and 23" rack mountable.
- J. Have storage and splicing options as part of the product offering.
- K. Support the addition of optical components such as WDM's and splitters to the product offering.
- L. Be available in putty.
- M. Be made by an ISO 9001 certified manufacturer.
- N. Provide port configurations and densities as called for on drawings.

#### 2.12 FIBER OPTIC FRAMES - RACK MOUNT (HIGH FIBER COUNT)

- A. All panels and trays (units) shall provide cross-connect, inter-connect, splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.
- B. Shall be available in putty, and made of 12-gauge aluminum alloy.

- C. Available in up to 24, 32, 48, and 72 port versions with ST® fiber adapters preloaded into adapter plates or 48, 64, 96 and 144 port versions using quad SC fiber adapters preloaded into adapter plates.
- D. Have preloaded adapter plates with SC, ST®, or LX.5 fiber adapters in 6 and 8 port versions as well as a 12 port version for the SC adapter.
- E. Have blank adapter plates for future growth of the fiber infrastructure.
- F. Have fiber managers to effectively store fiber cable slack and comply with fiber bend radius requirements.
- G. Have six and eight port fiber adapter plates, which allow for color coding connectors.
- H. Have fiber adapter plates with snap-in installation.
- I. Accommodate stackable splice trays, each tray manages a total of 24 splices.
- J. Have an adapter plate-mounting bracket, which slides out to the front and to the rear of the unit for increased access.
- K. Have cable access points for fiber jumpers entering and exiting the unit with rotating grommets to facilitate cable loading and to minimize micro bending stress.
- L. Have anchor points for fiber cable(s) entering the unit.
- M. Have labeling which meets or exceed ANSI/TIA/EIA-606 requirements and also be laser printable.
- N. Be able to mount both 19-inch and 23-inch rack/cabinets.
- O. Be UL C22.2 approved.
- P. Be made by an ISO 9001 Certified Manufacturer.
- Q. Provide port configurations and densities as called for on drawings.

#### 2.13 FIBER OPTIC FRAMES - (HIGH FIBER COUNT)

- A. All panels and trays (units) shall provide cross-connect, inter-connect, splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.
- B. Shall be available in 72 and 96 port configurations.
- C. Feature termination panels with individual adapter retainers.
- D. Feature termination panels with angled adapter retainers with ½ the panel angled to the left and ½ the panel to the right.
- E. Have various termination, splice and storage units available that can be mixed and matched within a common frame.
- F. Support termination densities up to 864 per frame.
- G. Offer connector styles of SC, FC, ST® and LX.5.

- H. Be made by an ISO 9001 certified manufacturer.
- I. Provide port configurations and densities as called for on drawings.

#### 2.14 FIBER OPTIC TRAYS - RACK MOUNT

- A. All panels and trays (units) shall provide cross-connect, inter-connect, splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.
- B. Rack-Mounted Fiber Tray
- C. The rack mounted fiber tray shall:
  - 1. Be made of 18-gauge steel with a black finish.
  - 2. Available in 16-, 24-, 28-, 32- and 48-port configurations, and be able to double that port count utilizing 6-port adapters.
  - 3. Accommodate SC, ST®, and LX.5 adapters.
  - 4. Accommodate hybrid adapter bezels for ST®-to-SC or SC-to-ST® connections.
  - 5. Have changeable ports, which are removed from the front of the unit to allow custom configuration or modification.
  - 6. Have silk-screened port identification numbers provided on both the front and rear of the panel.
  - 7. Include fiber managers that manage slack storage so as to comply with fiber bend radius requirements and slack storage length recommendations.
  - 8. Accommodate stackable splice trays, which manage up to 24 splices per tray.
  - 9. Have a smoked polycarbonate cover with quarter turn screws for easy access.
  - 10. Not exceed a 254 mm (10 in) depth for mounting in standard cabinets and enclosures.
  - 11. Be provided with strain relief lugs for the fiber cable entering the unit from the side or back.
  - 12. Be made by an ISO 9001 Certified Manufacturer.
  - 13. Provide port configurations and densities as called for on drawings.

#### 2.15 BACKBOARDS

- A. Shall be 4 x 8 x ¾" ACX or BCX, exterior grade, fire rated plywood.
- B. Shall be painted – gray, acrylic, interior, fire retardant paint.
- C. Provide adequate support and dress horizontal cabling between ladder rack and 66 wiring blocks as necessary or as shown on the drawings. Review cable routing plan for the Telecommunications Rooms, in the field, before installation of cabling commences.

#### 2.16 MODULAR 66M SYSTEM BLOCKS

- A. The connecting hardware block shall support the appropriate Category 6, applications and facilitate cross-connection and/or inter-connection using either approved cross-connect wire or patch cords.
- B. Shall be modular 66M System IDC style blocks.
- C. Be UL VERIFIED or equivalent for TIA/EIA proposed Category electrical performance.
- D. Be ANSI/TIA/EIA-568-A and ISO/IEC 11801 Category 6 compliant.
- E. The following requirements shall also be met (NEXT Loss and FEXT tested in both Differential and Common Mode):

Parameters	Performance @ 100 MHz
NEXT Loss	43.0 dB
FEXT	35.1 dB
Insertion Loss (Attenuation)	.4 dB
Return Loss	20 dB

- F. Be UL VERIFIED or equivalent for TIA/EIA proposed Category electrical performance.
- G. Be CSA C22.2 approved or equivalent.
- H. Be made of flame-retardant thermoplastic.
- I. Be available in 50-, 100-, and 300-pair sizes.
- J. Have 50-, 100, - and 300 pair blocks available without legs while the 100, and 300 pair blocks are available without legs.
- K. Blocks shall include means to identify cables/services per ANSI/TIA/EIA-606.
- L. Have clear label holders with the appropriate colored inserts available for the wiring blocks. The insert labels provided with the product shall contain vertical lines spaced on the basis of circuit size (3-, 4- or 5-pair) and shall not interfere with running, tracing or removing jumper wire/patch cords. Label holders must be capable of mounting in the under portion of the wiring block.
- M. Have connecting blocks used for either the termination of cross-connect (jumper) wire or patch cords. The connecting blocks shall be available in 3-, 4- and 5-pair sizes. All connecting blocks shall have color-coded tip and ring designation markers and be of single piece construction.
- N. Have connecting blocks with a minimum of 200 re-terminations without signal degradation below standards compliance limit.
- O. Support wire sizes: Solid 22-26 AWG (0.64 mm - 0.40 mm), and 7-strand wires.
- P. Be made by an ISO 9001 Certified Manufacturer.
- Q. Shall be 300 pair blocks, typical for feed and station cable, unless otherwise noted.
- R. Provide keep-off indicator buttons on all active cross-connected pairs used for alarm and security purposes. Coordinate the color and use with the Authority's representative.
- S. Provide connecting block designation label strips of the colors conforming to EIA/TIA 606, including but not limited to the following:

## 2.17 CROSS CONNECT

- A. Provide modular 66M cross connect blocks for all backbone terminations.
- B. Cross-connects shall be made with wire of equal gauge to that of the feed cable, which it is being connected to.
- C. Shall be UL listed
- D. Provide (1) roll of 1 pair and (1) roll of 2 pair per Telecommunications Room (TR). Coordinate

color code of one and two pair with the Authority's representative.

#### 2.18 POWER STRIP

- A. Shall be 20 amp, 115V.
- B. Shall be rack mounted.
- C. Shall be non-switched.
- D. Shall provide a minimum of one power strip per rack that contains active electronics, or as detailed on the drawings.
- E. Shall be surge suppressed.
- F. Shall have a minimum of 6 outlets – transformer spaced where possible.
- G. Must have 20 amp twist lock plug.
- H. Shall have a 10' cord, minimum.
- I. Shall be UL listed and must meet UL 1363 and 1449 requirements.

#### 2.19 OPTICAL FIBER PATCH CORDS - Multimode

- A. Shall be available in standard lengths of 1, 3, and 5 meters, custom lengths shall also be available, and shall meet or exceed standards as defined in ANSI/TIA/EIA-568-A and ISO/IEC 11801.
- B. Utilize duplex optical fiber cable that is 62.5/125 or 50/125 micron multimode, OFNR riser grade, and meets the requirements of UL 1666.
- C. Utilize optical fiber cable where the attenuation shall not exceed 3.5 dB/km @ 850 nm wavelength or 1.0 dB/km @ 1300 nm.
- D. Have a cable jacket color for 62.5/125 in gray and 50/125 in orange.
- E. Be equipped with SC or ST® in accordance with TIA/EIA-568-A and must include a ceramic ferrule.
- F. Have ST® connectors with a metal coupling nut.
- G. Have terminated connectors exhibit a maximum insertion loss of 0.75 dB with an average of 0.40dB when tested at either 850 nm or 1300 nm wavelengths for 62.5/125 □m.
- H. Have terminated connectors exhibit a maximum insertion loss of 0.75 dB with an average of 0.50dB when tested at either 850 nm or 1300 nm wavelengths for 50/125 □m.
- I. Have a minimum return loss of 20 dB (25 dB typical) at both 850 nm & 1300 nm.
- J. Be made by an ISO 9001 Certified Manufacturer.
- K. Be UL 1666 approved.
- L. Shall be a duplex fiber cable meeting or exceeding the transmission characteristics of the optical

fiber horizontal cable.

- M. Connectors shall be either LX.5 or duplex T568SC, as specified on the drawings or equipment schedules.
- N. Jackets shall be orange in color for multi-mode connections and yellow for single mode connections.
- O. The following configurations may be required:
  - 1. ST/ST
  - 2. SC/SC
  - 3. LX.5/LX.5
  - 4. ST/SC
  - 5. SC/LX.5
  - 6. ST/LX.5

## 2.20 CATEGORY 6 PATCH CORDS - MATCH COLOR OF VOICE CABLES

- A. Shall be round, and consist of eight insulated 24 AWG, stranded copper conductors, arranged in four color-coded twisted-pairs within a flame-retardant jacket.
- B. Be equipped with modular 8-position plugs on both ends, wired straight through with standards compliant wiring.
- C. Use modular plugs, which exceed FCC CFR 47 part 68 subpart F and IEC 60603-7 specifications, and have 50 microinches minimum of gold plating over nickel contacts.
- D. Be resistant to corrosion from humidity, extreme temperatures, and airborne contaminants.
- E. Utilize cable that exhibits power sum NEXT performance.
- F. Be available in several colors with or without color strain relief boots providing snagless design.
- G. Meet the flex test requirements of 1000 cycles with boots and 100 cycles without boots.
- H. Be available in any custom length and standard lengths of meters (3, 5, 7, 10, 15, 20, and 25 feet).
- I. Be made by an ISO 9001 Certified Manufacturer.
- J. Electrical Specifications:
  - 1. Input impedance without averaging 100 + 15% from 1 to 100 MHz.
  - 2. 100% transmission tested for performance up to 100 MHz. Manufacturer shall guarantee cords are compatible with Category 6 links.
  - 3. Utilize cable that is UL VERIFIED (or equivalent) for TIA/EIA proposed Category 6 electrical performance.
  - 4. UL LISTED 1863.

## 2.21 CATEGORY 6 PATCH CORDS - MATCH COLOR OF DATA CABLE

- A. Shall be round, and consist of eight insulated 24 AWG, stranded copper conductors, arranged in four color-coded twisted-pairs within a flame-retardant jacket.

- B. Be equipped with modular 8-position plugs on both ends, wired straight through with standards compliant wiring.
- C. Be backwards compatible with lower performing categories.
- D. Use modular plugs, which exceed FCC CFR 47 part 68 subpart F and IEC 60603-7 specifications, and have 50 microinches minimum of gold plating over nickel contacts.
- E. Have matching color strain relief boot with a snagless design which shall meet the flex testing as called out in 1000 cycles with boots and 100 cycles without boots.
- F. Be resistant to corrosion from humidity, extreme temperatures, and airborne contaminants.
- G. Utilize cable that exhibits power sum NEXT performance.
- H. Be available in any custom length and standard lengths of (3, 5, 7, 10, 15, 20, and 25 feet).
- I. Be made by an ISO 9001 Certified Manufacturer.
- J. Electrical Specifications:
  - 1. Have input impedance without averaging: 100 + 15% from 1 to 100 MHz, + 22% from 100 to 200 MHz and + 32% from 200 to 250 MHz.
  - 2. Be 100% transmission tested for performance up to 250 MHz. Manufacturer shall guarantee cords are compatible with proposed Cat-6 links.
  - 3. Utilize cable that is UL VERIFIED (or equivalent) for TIA/EIA proposed Category 6 electrical performance.
  - 4. Be UL LISTED 1863.

## 2.23 UNINTERUPPTABLE POWER SUPPLY (UPS)

- A. Input and Output connections of the UPS units shall be configured in accordance with the devices the unit is intended to power.
- B. Individual UPS units shall be sized to provided two (2) hours of operation for the equipment it powers.
- C. UPS units shall comply with the following specification:
  - 1. Waveform Type shall be sine wave.
  - 2. Battery Type Sealed Lead-Acid battery
  - 3. Interface Port: DB9, RS232
  - 4. Mgmt. Software Windows based with Server Shut down
  - 5. Rack Mounted.
  - 6. Acceptable Manufacturers:
    - a. APC
    - b. Tripp Lite
    - c. Best Power
    - e. Or approved equal

## PART 3 - EXECUTION

### 3.1 FLOOR MOUNTED RELAY RACKS

- A. All racks shall be anchored to the floor.

- B. Provide vertical and horizontal cable as shown on drawing.
- C. Mount with a minimum of 36" feet clear access behind and front of rack from the wall to a rack.
- D. Ground the rack to the equipment ground bar with a #6 copper wire.
- E. Communication grounding/earthing and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC 1000-5-2, ANSI/TIA/EIA-607, or both be observed throughout the entire cabling system.

### 3.2 WALL MOUNTED RELAY RACKS

- A. Secure Wall Mounted Relay Racks to building structure with approved anchoring means.
- B. Verify all existing wall construction and submit proposed anchoring methods for approval.
- C. Provide vertical and horizontal cable management both front and rear wherever available.

### 3.3 LADDER RACK

- A. Ladder Rack shall be secured to walls and top of equipment rack.
- B. Communication grounding/earthing and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC 1000-5-2, ANSI/TIA/EIA-607, or both be observed throughout the entire cabling system.

### 3.4 CABLE MANAGEMENT

- A. Provide horizontal and vertical cable management in each cabinet; with horizontal cable management between each piece of electronics.
- B. A horizontal crossover cable manager shall be provided at the top and bottom of each relay rack, with a minimum height of 2 rack units each.
- C. A horizontal crossover cable manager shall be provided near the center of each relay rack, with a minimum height of 4 rack units.
- D. Provide two rear cable management bars and reusable Velcro-type hook and loop straps in each rear vertical channel. Reusable straps shall be of varying sizes (each allowing 50% spare future expansion) and of adequate quantity to secure cable bundles at least every 4 rack units.
- E. Secure cable managers, slack managers, support bars, hook and loop straps per manufacturer recommendations.

### 3.5 CATEGORY 6 PATCH PANELS – VOICE

- A. Install and label as recommended by manufacturer per all EIA/TIA 606.
- B. Install rear cable management bar(s) as recommended by manufacturer.
- C. Install EIA/TIA 606 compliant color-coded icons or color-coded designation label strips for all patch panels. Identify voice functionality.

### 3.6 CATEGORY 6 PATCH PANELS – DATA

- A. Install and label as recommended by manufacturer, per all EIA/TIA 606.
- B. Install rear cable management bar(s) as recommended by manufacturer.
- C. Install EIA/TIA 606 compliant color-coded icons or color-coded designation label strips for all patch panels. Identify Data functionality.

### 3.7 OPTICAL FIBER PATCH PANELS

- A. Install as shown on drawings.
- B. Furnish and Install labels for each strand, as per the Authority's instruction in the field or as shown on drawings.
- C. Install blank adapter panels in all positions not used at time of installation for fiber terminations.

### 3.8 CABLE SUPPORTS

- A. Provide "D" rings on 2 ft. center for all exposed wall mounted vertical Category 6 cable runs.
- B. Keep horizontal wall mounted cable runs to a minimum. In general, horizontal runs shall be on wall mounted ladder rack.
- C. Provide cable brackets 3' on center supported to building structure for all cable runs not supported by cable tray.

### 3.9 BACKBOARDS

- A. Linear wall space used for anchoring equipment shall be lined for the full room width with plywood, per the drawings.
- B. Plywood for mounting termination equipment on shall be installed vertically, side by each, a minimum of 6" above finished floor. Mounting shall be sufficient enough to support the equipment.
- C. Plywood for supporting backbone riser cables shall be installed vertically, resting directly on the finished floor. Anchoring and mounting techniques of plywood used to support backbone riser cables shall be sufficient to support a minimum of 1000 pounds of weight.
- D. In no cases shall the heads of mounting screws protrude past the face of any plywood.
- E. Install distribution rings for the cross-connect fields above all wall mounted blocks. Two rings per vertical row of blocks. Mount rings with two hex head screws per ring.

### 3.10 MISCELLANEOUS REQUIREMENTS

- A. All cables shall be neatly "dressed out" in equipment rooms.
- B. Provide service loops on all cables terminated in the telecommunications rooms, per the drawings.
- C. Firestop all sleeves and conduits openings after the cable installation is complete.

### 3.11 MODULAT 66M SYSTEM BLOCKS

- A. Installed on plywood backboard so that top of 300 pair block is 5'6" AFF, or as noted on the drawing.
- B. Mount Blocks with steel, zinc plated 5/16" slotted hex head #10 x 3/4" drill screws, minimum four screws per block.
- C. Install designation strips color-coded in conformance with EIA/TIA 606 standard.
- D. Install insulator clips (sometimes called keep-offs) on all Life and Safety special circuits in the Telecommunications Rooms (MDF/IDF), coordinate desired color code requirements with the Authority's representative.

END OF SECTION 276600



## SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. UTP
  - 2. Low-voltage control cabling.
  - 3. Control-circuit conductors.
  - 4. Fire alarm wire and cable.
  - 5. Identification products.

#### 1.3 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. EMI: Electromagnetic interference.
- C. IDC: Insulation displacement connector.
- D. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- E. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).
- F. RCDD: Registered Communications Distribution Designer.

#### 1.4 SUBMITTALS

- A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.
- B. Seismic Qualification Certificates: For pathways, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Source quality-control reports.
- D. Field quality-control reports.
- E. Operation and Maintenance Data: For wire and cable to include in operation and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
  1. Allowable pulling tension of cable.
  2. Cable connectors and terminations recommended by the manufacturer.

#### 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An NRTL.
  1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

#### 1.6 PROJECT CONDITIONS

- A. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.
  1. Indications that wire and cables are wet or moisture damaged include, but are not limited to, discoloration and sagging of factory packing materials.

### PART 2 - PRODUCTS

#### 2.1 PATHWAYS

- A. Support of Open Cabling: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
  1. Support brackets with cable tie slots for fastening cable ties to brackets.
  2. Lacing bars, spools, J-hooks, and D-rings.
  3. Straps and other devices.
- B. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

## 2.2 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm). Comply with requirements for plywood backing panels in Division 06 Section "Rough Carpentry".

## 2.3 UTP CABLE

- A. Description: 100-ohm, 4-pair UTP, covered with a blue thermoplastic jacket.
  - 1. Comply with ICEA S-90-661 for mechanical properties.
  - 2. Comply with TIA/EIA-568-B.1 for performance specifications.
  - 3. Comply with TIA/EIA-568-B.2, Category 6.
  - 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
    - a. Communications, General Purpose: Type CM or CMG.
    - b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
    - c. Communications, Riser Rated: Type CMR, complying with UL 1666.
    - d. Communications, Limited Purpose: Type CMX.
    - e. Multipurpose: Type MP or MPG.
    - f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
    - g. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

## 2.4 LOW-VOLTAGE CONTROL CABLE

- A. Paired Cable: NFPA 70, Type CMG.
  - 1. 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors.
  - 2. PVC insulation.
  - 3. Unshielded.
  - 4. PVC jacket.
  - 5. Flame Resistance: Comply with UL 1581.
- B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
  - 1. 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors.
  - 2. PVC insulation.
  - 3. Unshielded.

4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

## 2.5 CONTROL-CIRCUIT CONDUCTORS

- A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway.
- B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

## 2.6 FIRE ALARM WIRE AND CABLE

- A. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
- B. Signaling Line Circuits: Twisted, shielded pair, No. 18 AWG or size as recommended by system manufacturer.
  1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a 2-hour rating.
- C. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
  1. Low-Voltage Circuits: No. 16 AWG, minimum.
  2. Line-Voltage Circuits: No. 12 AWG, minimum.
  3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with red identifier stripe, NRTL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

## 2.7 IDENTIFICATION PRODUCTS

- A. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF PATHWAYS

- A. Cable Trays: Comply with NEMA VE 2 and TIA-569-B.

- B. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
- C. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." for installation of conduits and wireways.
- D. Install manufactured conduit sweeps and long-radius elbows whenever possible.

### 3.2 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems." for installation of supports for pathways, conductors and cables.

### 3.3 WIRING METHOD

- A. Install wiring in metal raceways and wireways. Conceal raceway except in unfinished spaces and as indicated. Minimum conduit size shall be 1/2 inch (21 mm). Control and data transmission wiring shall not share conduit with other building wiring systems.
- B. Install wiring in raceways except in accessible indoor ceiling spaces and in interior hollow gypsum board partitions where cable may be used. Conceal raceways and wiring except in unfinished spaces and as indicated. Minimum conduit size shall be 1/2 inch (21 mm). Control and data transmission wiring shall not share conduit with other building wiring systems.
- C. Install cable, concealed in accessible ceilings, walls, and floors when possible.
- D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

### 3.4 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.
- C. General Requirements for Cabling:
  - 1. Comply with TIA/EIA-568-B.1.
  - 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
  - 3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
  - 4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
  6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
  7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
  8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- D. UTP Cable Installation: Install using techniques, practices, and methods that are consistent with Category 6 rating of components and that ensure Category 6 performance of completed and linked signal paths, end to end.
1. Comply with TIA/EIA-568-B.2.
  2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.

### 3.5 FIRE ALARM WIRING INSTALLATION

- A. Comply with NECA 1 and NFPA 72.
- B. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceway and Boxes for Electrical Systems."
1. Install plenum cable in environmental air spaces, including plenum ceilings.
  2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.
- C. Wiring Method:
1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
- D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- F. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different

colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

- G. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.
- H. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

### 3.6 POWER AND CONTROL-CIRCUIT CONDUCTORS

- A. 120-V Power Wiring: Install according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.
- B. Minimum Conductor Sizes:
  - 1. Class 1 remote-control and signal circuits, No. 14 AWG.
  - 2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
  - 3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

### 3.7 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping."
- B. Comply with TIA-569-B, "Firestopping" Annex A.
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

### 3.8 GROUNDING

- A. For communications wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

### 3.9 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

### 3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. End-to-end cabling will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 280513

## SECTION 283111 - DIGITAL, ADDRESSABLE FIRE ALARM SYSTEM

### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Manual fire-alarm boxes.
  - 2. System smoke detectors.
  - 3. Notification appliances.
  - 4. Digital alarm communicator transmitter.

#### 1.3 SYSTEM DESCRIPTION

- A. Non-coded, addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
  - 2. Include voltage drop calculations for notification appliance circuits.
  - 3. Include battery-size calculations.
- C. Qualification Data: For qualified Installer in the State of New York.
- D. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
  - 1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
  - 2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.

3. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
  - a. Frequency of testing of installed components.
  - b. Frequency of inspection of installed components.
  - c. Requirements and recommendations related to results of maintenance.
  - d. Manufacturer's user training manuals.
4. Manufacturer's required maintenance related to system warranty requirements.
5. Abbreviated operating instructions for mounting at fire-alarm control unit.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

#### 1.6 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Lamps for Strobe Units: Quantity equal to 2.
  2. Smoke Detectors, Fire Detectors: Quantity equal to 2.
  3. Detector Bases: Quantity equal to 2.
  4. Keys and Tools: One extra set for access to locked and tamper proof components.
  5. Fuses: Two of each type installed in the system.

### PART 2 PRODUCTS

#### 2.1 SYSTEMS OPERATIONAL DESCRIPTION

- A. Newly installed fire-alarm equipment shall operate in accordance with the building's existing fire-alarm system.
- B. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
  2. Heat detectors.
  3. Smoke detectors.
  4. Duct smoke detectors.
  5. Automatic sprinkler system water flow.
- C. Fire-alarm signal shall initiate the following actions:
1. Continuously operate alarm notification appliances.
  2. Identify alarm at fire-alarm control unit and remote annunciators.
  3. Transmit an alarm signal to the remote alarm receiving station.
  4. Record events in the system memory.
  5. Activate emergency lighting control.
- D. System trouble signal initiation shall be by one or more of the following devices and actions:
1. Open circuits, shorts, and grounds in designated circuits.
  2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
  3. Loss of primary power at fire-alarm control unit.
  4. Ground or a single break in fire-alarm control unit internal circuits.
  5. Abnormal ac voltage at fire-alarm control unit.
  6. Break in standby battery circuitry.
  7. Failure of battery charging.
  8. Abnormal position of any switch at fire-alarm control unit or annunciator.
  9. Fire-pump power failure, including a dead-phase or phase-reversal condition.
- E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote enunciators.

## 2.2 MANUAL FIRE-ALARM BOXES

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.

2. Station Reset: Key- or wrench-operated switch.

## 2.3 SYSTEM SMOKE DETECTORS

### A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be two-wire type minimum.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type indicating detector has operated and power on status.

### B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - a. Primary status.
  - b. Device type.
  - c. Present average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).

### C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - a. Primary status.
  - b. Device type.
  - c. Present average value.
  - d. Present sensitivity selected.

- e. Sensor range (normal, dirty, etc.).
- 3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
- 4. Each sensor shall have multiple levels of detection sensitivity.
- 5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
- 6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

## 2.4 HEAT DETECTORS

- A. General Requirements for Heat Detectors: Comply with UL 521.
- B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
  - 1. Mounting: Adapter plate for outlet box mounting.
  - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

## 2.5 NOTIFICATION APPLIANCES

- A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling line circuit, equipped for mounting as indicated and with screw terminals for system connections.
- B. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.
  - 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.
- C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.
- D. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1 inch high letters on the lens.
  - 1. Rated Light Output:
    - a. 15/30/75/110 cd, selectable in the field.
  - 2. Mounting: Wall mounted unless otherwise indicated.
  - 3. Flashing shall be in a temporal pattern, synchronized with other units.

4. Strobe Leads: Factory connected to screw terminals.
5. Mounting Faceplate: Factory-finished, red.

## PART 3 EXECUTION

### 3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72 for installation of fire-alarm equipment.
- B. Equipment Mounting: Install fire-alarm control unit with tops of cabinets not more than 72 inches above the finished floor.
- C. Smoke- or Heat-Detector Spacing:
  1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
  2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
  3. HVAC: Locate detectors not closer than 5 feet from air-supply diffuser or return-air opening.
- D. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.
- E. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location
- F. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling and not less than 80 inches above the floor. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
- G. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling and not less than 80 inches above the floor.
- H. Manual Pull Stations: Install device at 48 inches above floor.

### 3.2 CONNECTIONS

- A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
  1. Supervisory connections at valve supervisory switches.

### 3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

- B. Install framed instructions in a location visible from fire-alarm control unit.

### 3.4 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

### 3.5 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by Construction Manager.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
  - 1. Visual Inspection: Conduct visual inspection prior to testing.
    - a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
    - b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
  - 2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
  - 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
  - 4. Test visible appliances for the public operating mode according to manufacturer's written instructions.
  - 5. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
- E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

END OF SECTION 283111