

**PROJECT MANUAL**  
**Division 00 – 28**



**Cooper Medical School**  
of Rowan University

**COOPER MEDICAL  
SCHOOL OF  
ROWAN UNIVERSITY**

**CENTER FOR NEURAL  
INFLAMMATION**

401 Broadway  
Camden, New Jersey 08103

NK Project #R2024.099

**ISSUED FOR BID**

January 31, 2025



95 Washington Street, Morristown NJ 07960  
The Woolworth Building, 233 Broadway Suite 2150, New York NY 10279  
[www.nkarchitects.com](http://www.nkarchitects.com)



## **PROJECT INDEX**

### **PART 1 – GENERAL DOCUMENTS**

#### **VOLUME 1**

##### **DIVISION 00 – BIDDING AND CONTRACT DOCUMENTS**

SECTION I	Construction Contract
SECTION II	Exhibit A: Insurance and Bonds
SECTION III	General Conditions
SECTION IV	<u>Forms</u>
	Allowance Authorization Form
	Allowance Charge Request Form
	Request for Information Form
	Change Order Request Form
	Change Order Form
	Hourly Labor Rate Breakdown Form
	Daily Job Report Form
	Application and Certificate for Payment Form (AIA G702)
	Attachment to G702 Certification For Payment
	Contractor's Partial or Final Release And Waiver of Liens
	Rowan Tax Exempt Letter
	Consent of Surety Company to Final Payment (AIA G707)

##### **DIVISION 01 – GENERAL REQUIREMENTS**

Section	011100	Summary of Work
	011400	Work Restrictions
	012100	Allowances
	012400	Procedures and Controls
	012500	Substitution Procedures
	012600	Contract Modification Procedures
	012900	Payment Procedures
	013100	Coordination
	013110	Requests for Interpretation
	013200	Construction Progress Documentation
	013233	Photographic Documentation
	013300	Submittal Procedures
	013546	Indoor Air Quality Management
	014000	Quality Control Requirements
	014100	Testing Laboratory Services
	014200	Reference Standards
	014523	Testing and Inspections
	015000	Construction Facilities and Temporary Controls
	016000	Product Requirements
	017300	Execution
	017419	Construction Waste Management and Disposal
	017700	Contract Closeout
	017823	Operation and Maintenance Data
	017839	Project Record Documents
	017900	Demonstration and Training

## **PART 2 – TECHNICAL SPECIFICATIONS**

### **DIVISION 02 – EXISTING CONDITIONS**

Section 024119 Selective Demolition

### **DIVISION 03 – CONCRETE**

Section 035413 Gypsum Cement Underlayment

### **DIVISION 04 – MASONRY** *(Not Used)*

### **DIVISION 05 – METALS**

Section 055000 Metal Fabrication

### **DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES**

Section 061053 Miscellaneous Rough Carpentry

### **DIVISION 07 – THERMAL AND MOISTURE PROTECTION**

Section 072100 Thermal Insulation  
078413 Penetration Firestopping  
078446 Joint Firestopping  
079200 Joint Sealants  
079219 Acoustical Joint Sealants

### **DIVISION 08 – OPENINGS**

Section 080671 Door Hardware Schedule  
081113 Hollow Metal Doors and Frames  
081416 Flush Wood Doors  
083113 Access Doors and Frames  
087100 Door Hardware  
088000 Glazing

### **DIVISION 09 – FINISHES**

Section 092216 Non-Structural Metal Framing  
092900 Gypsum Board  
095123 Acoustical Tile Ceilings  
096513 Resilient Base and Accessories  
096519 Resilient Tile Flooring  
096812 Tile Carpeting  
099123 Interior Painting

### **DIVISION 10 – SPECIALTIES**

Section 101420 Code Required Signage  
102600 Wall Protection  
104413 Fire Protection Cabinets  
104416 Fire Extinguishers

### **DIVISION 11 – EQUIPMENT**

Section 115343 Service Fittings and Accessories

### **DIVISION 12 – FURNISHINGS**

Section 122413 Roller Window Shades  
123553.13 Metal Laboratory Casework

### **DIVISION 13 – SPECIAL CONSTRUCTION** *(Not Used)*

**DIVISION 14 – CONVEYING EQUIPMENT (Not Used)**

**DIVISION 21 – FIRE SUPPRESSION**

Section	210500	Common Work Results For Fire Suppression
	210529	Hangers And Supports For Fire Protection Piping And Equipment
	210553	Identification For Fire Suppression Piping And Equipment
	211300	Fire Suppression Sprinkler Systems

**DIVISION 22 – PLUMBING**

Section	220529	Hangers and Supports for Plumbing Piping and Equipment
	220553	Identification for Plumbing Piping and Equipment
	220716	Plumbing Equipment Insulation
	220717	Piping Safety Covers
	220719	Plumbing Piping Insulation
	221005	Plumbing Piping
	221006	Plumbing Piping Specialties
	223000	Plumbing Equipment
	224000	Plumbing Fixtures
	226005	Medical Air, Gas and Vacuum Systems

**DIVISION 23 – HEATING VENTILATING AND AIR CONDITIONING (HVAC)**

Section	230513	Common Motor Requirements for HVAC Equipment
	230519	Meters and Gages For HVAC
	230529	Hangers and Supports for HVAC Piping and Equipment
	230548	Vibration and Seismic Controls for HVAC Piping and Equipment
	230553	Identification for HVAC Piping and Equipment
	230593	Testing, Adjusting and Balancing For HVAC
	230713	Duct Insulation
	230716	HVAC Equipment Insulation
	230719	HVAC Piping Insulation
	230800	Commissioning Of HVAC
	232113	Hydronic Piping
	232114	Hydronic Specialties
	233100	HVAC Ducts and Casings
	233300	Air Duct Accessories
	233600	Air Terminal Units
	233700	Air Outlets and Inlets

**DIVISION 25 – INTEGRATED AUTOMATION (Not Used)**

**DIVISION 26 – ELECTRICAL**

Section	260519	Low-Voltage Electrical Power Conductors and Cables
	260526	Grounding and Bonding for Electrical Systems
	260529	Hangers and Supports for Electrical Systems
	260534	Conduits
	260537	Boxes
	260553	Identification for Electrical Systems
	260923.13	Distributed Digital Lighting Control System
	262416	Panelboards
	262717	Equipment Wiring
	262726	Wiring Devices
	265100	Interior Lighting

**DIVISION 27 – COMMUNICATIONS**

Section	271000	Telecommunications Cabling
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**DIVISION 28 – ELECTRONIC SAFETY AND SECURITY**

Section      283105      Fire Alarm System Equipment

END OF INDEX

# DRAFT AIA® Document A101™ – 2017

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

**AGREEMENT** made as of the \_\_\_\_ day of \_\_\_\_\_ in the year **2025**  
(In words, indicate day, month and year.)

**BETWEEN** the Owner:

Rowan University  
201 Mullica Hill Road  
Glassboro, NJ 08028

and the Contractor:

for the following Project:

Center for Neural Inflammation  
Cooper Medical School of Rowan University (CMSRU)  
401 South Broadway  
Camden, NJ

The Architect:

NK Architects  
107-109 S. 13th Street, Suite B  
Philadelphia, PA 19107

The Owner and Contractor agree as follows.

**ADDITIONS AND DELETIONS:**

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

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

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

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## TABLE OF ARTICLES

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

## EXHIBIT A INSURANCE AND BONDS

### ARTICLE 1 THE CONTRACT DOCUMENTS

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

### ARTICLE 2 THE WORK OF THIS CONTRACT

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

### ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be

- [ ☐ ] The date of this Agreement.
- [ ☐ ] A date set forth in a notice to proceed issued by the Owner.
- [ ☐ ] Established as follows:  
(Insert a date or a means to determine the date of commencement of the Work.)  
[ ☐ ]

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

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work. **TIME IS OF THE ESSENCE.**

### § 3.3 Substantial Completion

**Commented [CEG1]:** Want to attach Bid Solicitation as Exhibit "A" and Bid Submission as Exhibit "B" if applicable.



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

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

☐ Not later than ( ) calendar days from the date of commencement of the Work.

☒ By the following date:

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

Portion of Work	Substantial Completion Date
Entire Scope of Work	

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

Liquidated damages of \$	per day for each calendar day substantial completion is not achieved.
Liquidated damages of \$	per day for each calendar day work on the closeout/punch list is incomplete

§ 3.4 By submission of the its Bid and execution of the Contract, the Contractor agrees that the time specified for Final Completion of the Work is a reasonable period for completion of the Work taking into consideration the average climatic range, material delivery time experience in the Contractor's industry.

§ 3.5 Should the Contractor fail to substantially complete the Work by the date set for Substantial Completion set forth above, the Contractor shall and hereby agrees to pay the Owner the sum of **\$1000 per day** for each consecutive calendar day which elapses between the above-referenced date set for Substantial Completion and the date of actual Substantial Completion as certified to and approved by the Owner. Should the Contractor fail to fully complete the Work in conformity with all provisions of the Contract by the date set for Final Completion set forth above, the Contractor shall and hereby agrees to pay the Owner the sum of **\$1000 per day** for each consecutive calendar day which elapses between the above-referenced date set for Final Completion and the date of actual Final Completion as certified to and approved by the Owner.

§ 3.6 The per day liquidated damages sum referenced herein is hereby agreed to be a reasonable and proper measure of damages which the Owner will sustain per diem by failure of Contractor to complete Work within time as stipulated; it being recognized by Owner and Contractor that the damages suffered by Owner which could result from a failure of the Contractor to complete the Work on schedule is uncertain and cannot be calculated with any degree of mathematical certainty. In no way shall costs of Liquidated Damages be construed as a penalty to the Contractor. In addition to liquidated damages, Owner shall have the right to recover the actual damages as are capable of being ascertained and which are not duplicative of elements covered by the liquidated damages provisions. Nothing in this paragraph shall limit the right of Owner to complete the Work following the Contractor's breach of contract.

#### ARTICLE 4 CONTRACT SUM

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

#### § 4.2 Alternates

§ 4.2.1 Alternates, if any, are inclusive of the total Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.

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User Notes:

(1834509656)

(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the total Contract Sum reflected in Section 4.1:  
(Identify each allowance.)

Item	Price

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

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

§ 4.5 Liquidated damages, if any:  
(Insert terms and conditions for liquidated damages, if any.)

See Sections 3.3, 3.4, 3.5, and 3.6 above.

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

Not Applicable.

## ARTICLE 5 PAYMENTS

### § 5.1 Progress Payments

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

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month.

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the last day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the last day of the following month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than Forty Five ( 45 ) days after the Architect receives the Application for Payment.  
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.3.1 APPLICATIONS FOR PAYMENT: The form for Applications for Payment shall be a notarized AIA Document G702, Application and Certification for Payment, supported by AIA document G703 Continuation Sheets. Each Application for Payment must be accompanied by three (3) sets of Certified Payroll Records for the period covered by the Application. The payroll records shall indicate the proper classification of employees and the payment of overtime, if any. These records shall include each Contractor's subcontractor's certified payroll. Payment will not be authorized if the required payroll records have not been submitted.

§ 5.1.3.2 All Applications for Payment, Certified Payroll Records and Manning Reports shall include the relevant purchase order number and project number.

§ 5.1.4 The Owner may decide to disapprove an Application for Payment, or withhold payment, in whole or in part, to the extent reasonably necessary to protect the Owner if, in its opinion, the representations as described in Section 5.1.4.1 below cannot be made. If the Owner withholds a Certificate for Payment, the Owner will notify the

Contractor as provided in Article 5 hereof. The Owner may also decide to withhold certifying payment in whole or in part, because of subsequently discovered evidence or subsequent observations, to such extent as may be necessary to protect the Owner from loss because of:

1. Defective Work which has not been remedied;
2. Third party claims filed or reasonable belief probable filing of such claims;
3. Failure of the Contractor to make payments properly to vendors, subcontractors or for labor, materials and equipment;
4. Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract sum;
5. Damage to the Owner or another contractor;
6. Reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
7. Failure to carry out the Work in accordance with the Contract Documents;
8. Avoidable delay in the progress of the Work;
10. Failure to maintain the Project Site in a safe and satisfactory condition in accordance with good construction practices as recommended by the Engineer after consultation with the Contractor; and
11. Failure to submit updates as requested by the Owner or as required by the General Conditions.

When the foregoing reasons for withholding payment are resolved, certification will be made for amounts previously withheld in the manner set forth in Section 5.1.3 above.

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

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

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

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

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

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

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

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

#### § 5.1.7 Retainage

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

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

Retainage shall be determined as follows: the Owner will withhold Five percent (5%) of the amount due on each partial payment when the outstanding balance of the Contract is more than \$500,000. When the outstanding balance of the Contract is Five Hundred Thousand Dollars (\$500,000.00) or less, Owner will withhold five percent (10%) as retainage. Retainage shall be withheld until the Owner determines that the work has been satisfactorily completed and no unsettled claims exist. The final acceptance shall not be binding or conclusive upon the Owner should it subsequently discover that the contractor has supplied inferior material or workmanship or has departed from the terms of his contract. Should such a condition appear the Owner shall have the right, notwithstanding final acceptance and payment, to cause the work to be properly done in accordance with the drawings and specifications at the cost and expense of the contractor.

§ 5.1.7.1.1 The following items are not subject to retainage:

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

None.

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

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

None.

#### § 5.1.7.3

Intentionally Omitted.

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

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

#### § 5.2 Final Payment

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

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

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 45 days after the issuance of the final Certificate for Payment.

« »

### § 5.3 Interest

Payments due and unpaid under the Contract shall bear no interest from the date payment is due at the rate stated below.

## ARTICLE 6 DISPUTE RESOLUTION

### § 6.1 Initial Decision Maker

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

### § 6.2 Binding Dispute Resolution

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

(Check the appropriate box.)

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

☒ Litigation in New Jersey Superior Court, Gloucester County.

☐ Other (Specify)

« »

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

## ARTICLE 7 TERMINATION OR SUSPENSION

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

« »

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

## ARTICLE 8 MISCELLANEOUS PROVISIONS

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

§ 8.2 The Owner's representative:

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

Project Manager

Rowan University  
201 Mullica Hill Road  
Glassboro, NJ 02028

@rowan.edu

§ 8.3 The Contractor's representative:

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

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User Notes:

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

#### § 8.5 Insurance and Bonds

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

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

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

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

« »

#### § 8.7 Other provisions:

§8.8 It is the obligation of the Contractor to provide a full and complete copy of all insurance policies held by it at the Contractor's sole expense, upon reasonable request by the Owner, in the amounts specified in the Bid Documents ( see Article 11 of modified AIA Document A201-2007 General Conditions of the Contract for Construction). The Contractor's failure to obtain or maintain adequate insurance coverage shall result in the immediate termination of this Agreement. The Owner will have the right to request copies of the Contractor's insurance policies or any part thereof for the duration of the contract period.

§8.9 This Agreement, the General Conditions of the Contract as modified or supplemented in writing, and the Supplemental General Conditions shall control in the case of conflict between these documents and the Project Specifications, the Project Manual and any other exhibits incorporated by reference into this Agreement in Article 9 herein.

#### ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction
- .4 Drawings: None
- .5 Project Manual

Section	Title	Date	Pages



.7 Addenda, if any:

Number	Date	Pages

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

.8 Other Exhibits:

(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

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

☐

☐ The Sustainability Plan:

Title	Date	Pages

☐ Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:

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

The Bid Package attached hereto as Exhibit "A"  
Contractor's Bid attached hereto as Exhibit "B"

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

OWNER (Signature)

CONTRACTOR (Signature)

Joseph Scully, CFO



# DRAFT AIA® Document A101® – 2017

## Exhibit A

### Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the « » day of « » in the year « »  
(In words, indicate day, month and year.)

for the following **PROJECT**:  
(Name and location or address)

« »  
« »

**THE OWNER:**  
(Name, legal status and address)

« »  
« »

**THE CONTRACTOR:**  
(Name, legal status and address)

« »  
« »

#### TABLE OF ARTICLES

- A.1 GENERAL
- A.2 OWNER'S INSURANCE
- A.3 CONTRACTOR'S INSURANCE AND BONDS
- A.4 SPECIAL TERMS AND CONDITIONS

#### ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

#### ARTICLE A.2 OWNER'S INSURANCE

##### § A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide evidence of insurance through issuance of a certificate of insurance or a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements as available from the insurance marketplace.

##### § A.2.2 Liability Insurance

Rowan University is an agency of the State of New Jersey. Any agreement signed, or any

#### ADDITIONS AND DELETIONS:

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

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

This document is intended to be used in conjunction with AIA Document A201®–2017, General Conditions of the Contract for Construction. Article 11 of A201®–2017 contains additional insurance provisions.

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action, act, failure to act or any other similar undertaking on behalf of the State of New Jersey by a State official shall be subject to all of the provisions of the New Jersey Tort Claims Act (N.J.S.A. 59:1-1 et seq.), the New Jersey Contractual Liability Act (N.J.S.A. 59:13-1 et seq.), and the availability of appropriations.

The State of New Jersey does not carry public liability insurance, but the liability of the State and the obligation of the State to be responsible for tort claims against its employees is covered under the terms and provisions of the New Jersey Tort Claims Act. The Act also creates a fund and provides for payment of claims under the Act, including claims alleging professional error and/or omissions, against the State of New Jersey or against its employees for which the State is obligated to indemnify against tort claims, which arise out of the performance of their duties.

Rowan University provides statutory workers' compensation protection to its employees in accordance with the New Jersey Workers' Compensation Act (N.J.S.A. 34:15-1 et seq.).

Claims against the State of New Jersey or its employees should be referred to the State of New Jersey, Division of Risk Management, P.O. Box 620, Trenton, NJ 08625.

### **§ A.2.3 Required Property Insurance**

**§ A.2.3.1** Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on an "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in insured property during construction on the Project, solely to the extent of the Insured's legal liability for insured physical loss or damage to such property. This insurance shall include the interests of mortgagees as loss payees, if applicable.

**§ A.2.3.1.1 Causes of Loss.** The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as outlined in the property insurance policy.  
(Indicate below the cause of loss and any applicable sub-limit.)

**Causes of Loss**

**Sub-Limit**

**§ A.2.3.1.2 Specific Required Coverages.** The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as outlined in the property insurance policy.

(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

**Coverage**

**Sub-Limit**

**§ A.2.3.1.3** Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

**§ A.2.3.1.4 Deductibles and Self-Insured Retentions.** If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Contractor shall be responsible for all loss not covered because of such deductibles or retentions, unless the loss is caused by the negligence of the Owner.

**§ A.2.3.2 Occupancy or Use Prior to Substantial Completion.** The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

**§ A.2.3.3 Insurance for Existing Structures**

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

**§ A.2.4 Optional Extended Property Insurance.**

The Owner shall purchase and maintain the insurance selected and described below.

*(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)*

[ ☒ ] **§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance,** to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

« »

[ ☒ ] **§ A.2.4.2 Ordinance or Law Insurance,** for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

« »

[ ☒ ] **§ A.2.4.3 Expediting Cost Insurance,** for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

« »

[ ☒ ] **§ A.2.4.4 Extra Expense Insurance,** to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

« »

[ ☒ ] **§ A.2.4.5 Civil Authority Insurance,** for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

« »

[ ☒ ] **§ A.2.4.6 Ingress/Egress Insurance,** for loss due to the necessary interruption of the insured's business

due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

« »

- [ ☒ ] § **A.2.4.7 Soft Costs Insurance**, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

« »

#### § A.2.5 Other Optional Insurance. NOT APPLICABLE

The Owner shall purchase and maintain the insurance selected below.

*(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)*

- [ ☐ ] § **A.2.5.1 Cyber Security Insurance** for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information. *(Indicate applicable limits of coverage or other conditions in the fill point below.)*

« »

- [ ☐ ] § **A.2.5.2 Other Insurance**  
*(List below any other insurance coverage to be provided by the Owner and any applicable limits.)*

Coverage

Limits

### ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

#### § A.3.1 General

§ **A.3.1.1 Certificates of Insurance.** The Contractor shall provide certificates of insurance or policies of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner, the State of New Jersey, and the New Jersey Educational Facilities Authority each as an additional insured on the Contractor's Commercial General Liability, Automobile Liability, and excess or umbrella liability policy or policies. All insurance must be placed with an insurance company licensed to conduct business in the State of New Jersey and maintaining an A.M. Best Rating of "A" or better with a financial size rating of Class XI or larger. All insurance required herein shall be written on an Occurrence basis, unless otherwise noted and shall contain a waiver of subrogation in favor of Rowan University, the State of New Jersey, and the New Jersey Educational Facilities Authority. No insurance policy will be cancelled, reduced, or revised without thirty (30) days prior written notice to Rowan University. In addition, required insurance will be primary to any other insurance available and any limitations of Contractor's insurance will not relieve Contractor of its indemnification responsibilities to Rowan University, the State of New Jersey, and the New Jersey Educational Facilities Authority as outlined in Contract.

If any of Contractor's insurance does not include the Architect's, Subcontractors, Sub-subcontractors or other parties engaged for the Project, Contractor will ensure that these parties maintain insurance of the same type and limits.

**§ A.3.1.2 Deductibles and Self-Insured Retentions.** The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor and shall be responsible for such deductibles or retentions.

**§ A.3.1.3 Additional Insured Obligations.** To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's coverage under the New Jersey Tort Claims Act and insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

### **§ A.3.2 Contractor's Required Insurance Coverage**

**§ A.3.2.1** The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:  
*(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)*

« »

### **§ A.3.2.2 Commercial General Liability**

1. **§ A.3.2.2.1** Commercial General Liability insurance for the Project with a "per location or Project endorsement" included so that the general aggregate limit applies separately to the Rowan Project, and written on a current ISO Occurrence Form or equivalent with policy limits of not less than Two Million Dollars (\$ 2,000,000) each occurrence, Four Million Dollars (\$ 4,000,000) general aggregate, and Four Million Dollars (\$4,000,000) aggregate for products completed operations hazard. Coverage under the General Liability will include but not be limited to:

- .1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
- .2 personal injury and advertising injury;
- .3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
- .4 bodily injury or property damage arising out of completed operations; and
- .5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

**§ A.3.2.2.2** The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

- .1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
- .2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
- .3 Claims for bodily injury other than to employees of the insured.
- .4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.
- .5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
- .6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
- .7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.

- .8 Claims related to roofing, if the Work involves roofing.
- .9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
- .10 Claims related to earth subsidence or movement, where the Work involves such hazards.
- .11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

**§ A.3.2.3** Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than « Two Million Dollars » (\$ « 2,000,000 » ) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

**§ A.3.2.4** The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

**§ A.3.2.5** Workers' Compensation with statutory limits applicable to the laws of the State of New Jersey and any other State or Federal jurisdiction required to protect the employees of Contractor who will be engaged in the performance of work under this contract.

**§ A.3.2.6** Employers' Liability with policy limits not less than One Million Dollars (\$1,000,000) bodily injury, each occurrence; One Million Dollars (\$1,000,000) disease, each employee; and One Million Dollars (\$1,000,000) disease, aggregate limit.

**§ A.3.2.7** Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

**§ A.3.2.8 NOT APPLICABLE** If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than Five Million Dollars (\$5,000,000) per claim and Five Million Dollars (\$ 5,000,000) in the annual aggregate. If this policy is written on a claims-made policy form, Contractor agrees that upon termination of the claims-made policy a retroactive reporting policy (tail policy) will be purchased to provide coverage for a period of five (5) years following Completion of the Project and Owner Occupancy for losses that result from the professional services provided during the term of this contract.

**§ A.3.2.9 NOT APPLICABLE** If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than Five Million Dollars (\$5,000,000) per claim and Five Million Dollars (\$5,000,000) in the annual aggregate. If this policy is written on a claims-made policy form, Contractor agrees that upon termination of the claims-made policy a retroactive reporting policy (tail policy) will be purchased to provide coverage for a period of five (5) years following Completion of the Project and Owner Occupancy for losses that occurred during, or as a result of, the provision of services under this contract.

**§ A.3.2.10 NOT APPLICABLE** Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than « Ten Million Dollars » (\$ «10,000,000 » ) per claim and « Ten Million Dollars » (\$ « 10,000,000 » ) in the aggregate.

**§ A.3.2.11 NOT APPLICABLE** Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than « Ten Million Dollars » (\$ « 10,000,000 » ) per claim and «Ten Million Dollars » (\$ « 10,000,000 » ) in the aggregate.

**§ A.3.2.12 NOT APPLICABLE** Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than « Ten Million Dollars » (\$ «10,000,000 » ) per claim and «Ten Million Dollars » (\$ « 10,000,000 » ) in the aggregate.

A.3.2.13 Property Insurance on an “all-risks” completed value form, covering property owned by the Contractor and used on the Project. This insurance shall protect against damage or loss to any of the Contractor’s or Subcontractor’s tools, equipment, scaffolding, staging towers or forms, Contractor’s materials and sheds or other temporary structures erected for use by the Contractor or Subcontractors.

A.3.2.14 If access to Owner’s Information Technology Systems will be granted, Cyber Breach/Privacy Liability Insurance, providing coverage for 1)Privacy Liability, Network Security Liability, and Regulatory Liability; 2) Payment Card Industry (PCI) Fines, Penalties, and Assessments (if applicable); 3)Breach Response Costs including Data Forensics, Public Relations, and Privacy Counsel, and 4) Notification, Credit Monitoring, and Identity Theft Restoration Costs. Limits of liability will be in the minimum amounts of Five Million Dollars (\$5,000,000). If this policy is written on a claims-made policy form, Contractor agrees that upon termination of the claims-made policy a retroactive reporting policy (tail policy) will be purchased to provide coverage for a period of five (5) years for all claims received after Completion of the Project and Owner Occupancy.

### **§ A.3.3 Contractor’s Other Insurance Coverage NOT APPLICABLE**

**§ A.3.3.1** Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

*(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)*

« »

**§ A.3.3.2** The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.

*(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)*

- [ « » ] **§ A.3.3.2.1** Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below: *(Where the Contractor’s obligation to provide property insurance differs from the Owner’s obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)*

« »

[ « » ] § A.3.3.2.2 **Railroad Protective Liability Insurance**, with policy limits of not less than « » (\$ « » ) per claim and « » (\$ « » ) in the aggregate, for Work within fifty (50) feet of railroad property.

[ « » ] § A.3.3.2.3 **Asbestos Abatement Liability Insurance**, with policy limits of not less than « » (\$ « » ) per claim and « » (\$ « » ) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

[ « » ] § A.3.3.2.4 Insurance for physical damage to property while it is in storage and in transit to the construction site on an “all-risks” completed value form.

[ « » ] § A.3.3.2.5 Property insurance on an “all-risks” completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[ « » ] § A.3.3.2.6 **Other Insurance**  
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

**Coverage**

**Limits**

**§ A.3.4 Performance Bond and Payment Bond**

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:

(Specify type and penal sum of bonds.)

Type

Penal Sum (\$0.00)

Payment Bond

Performance Bond

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

**ARTICLE A.4 SPECIAL TERMS AND CONDITIONS**

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

« »



# DRAFT AIA® Document A201™ - 2017

## General Conditions of the Contract for Construction

### for the following PROJECT:

(Name and location or address)

Center for Neural Inflammation  
Cooper Medical School of Rowan University (CMSRU)  
401 South Broadway  
Camden, NJ

### THE OWNER:

(Name, legal status and address)

Rowan University  
201 Mullica Hill Road  
Glassboro, NJ 08028

### THE ARCHITECT:

(Name, legal status and address)

NK Architects  
107-109 S. 13th Street, Suite B  
Philadelphia, PA 19107

### TABLE OF ARTICLES

1	GENERAL PROVISIONS
2	OWNER
3	CONTRACTOR
4	ARCHITECT
5	SUBCONTRACTORS
6	CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
7	CHANGES IN THE WORK
8	TIME
9	PAYMENTS AND COMPLETION
10	PROTECTION OF PERSONS AND PROPERTY
11	INSURANCE AND BONDS
12	UNCOVERING AND CORRECTION OF WORK
13	MISCELLANEOUS PROVISIONS

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14      TERMINATION OR SUSPENSION OF THE CONTRACT

15      CLAIMS AND DISPUTES



## INDEX

(Topics and numbers in bold are Section headings.)

### Acceptance of Nonconforming Work

9.6.6, 9.9.3, **12.3**

Acceptance of Work

9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3

### Access to Work

**3.16**, 6.2.1, 12.1

Accident Prevention

10

Acts and Omissions

3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5,

10.2.8, 13.3.2, 14.1, 15.1.2, 15.2

Addenda

1.1.1

Additional Costs, Claims for

3.7.4, 3.7.5, 10.3.2, 15.1.5

### Additional Inspections and Testing

9.4.2, 9.8.3, 12.2.1, **13.4**

### Additional Time, Claims for

3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.6**

### Administration of the Contract

3.1.3, **4.2**, 9.4, 9.5

Advertisement or Invitation to Bid

1.1.1

Aesthetic Effect

4.2.13

### Allowances

**3.8**

### Applications for Payment

4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.5.4, 9.6.3, 9.7, 9.10

Approvals

2.1.1, 2.3.1, 2.5, 3.1.3, 3.10.2, 3.12.8, 3.12.9,

3.12.10.1, 4.2.7, 9.3.2, 13.4.1

### Arbitration

8.3.1, 15.3.2, **15.4**

## ARCHITECT

**4**

Architect, Definition of

**4.1.1**

Architect, Extent of Authority

2.5, 3.12.7, 4.1.2, 4.2, 5.2, 6.3, 7.1.2, 7.3.4, 7.4, 9.2,

9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1,

13.4.1, 13.4.2, 14.2.2, 14.2.4, 15.1.4, 15.2.1

Architect, Limitations of Authority and

Responsibility

2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2,

4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4,

9.4.2, 9.5.4, 9.6.4, 15.1.4, 15.2

Architect's Additional Services and Expenses

2.5, 12.2.1, 13.4.2, 13.4.3, 14.2.4

Architect's Administration of the Contract

3.1.3, 3.7.4, 15.2, 9.4.1, 9.5

Architect's Approvals

2.5, 3.1.3, 3.5, 3.10.2, 4.2.7

Architect's Authority to Reject Work

3.5, 4.2.6, 12.1.2, 12.2.1

Architect's Copyright

1.1.7, 1.5

Architect's Decisions

3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3,

7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1,

13.4.2, 15.2

Architect's Inspections

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.4

Architect's Instructions

3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.4.2

Architect's Interpretations

4.2.11, 4.2.12

Architect's Project Representative

4.2.10

Architect's Relationship with Contractor

1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2,

3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16,

3.18, 4.1.2, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5,

9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.3.2, 13.4, 15.2

Architect's Relationship with Subcontractors

1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, **9.6.4**, 11.3

Architect's Representations

9.4.2, 9.5.1, 9.10.1

Architect's Site Visits

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4

Asbestos

10.3.1

Attorneys' Fees

3.18.1, 9.6.8, 9.10.2, 10.3.3

Award of Separate Contracts

6.1.1, 6.1.2

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

**5.2**

## Basic Definitions

**1.1**

Bidding Requirements

1.1.1

Binding Dispute Resolution

8.3.1, 9.7, 11.5, 13.1, 15.1.2, 15.1.3, 15.2.1, 15.2.5,

15.2.6.1, 15.3.1, 15.3.2, 15.3.3, 15.4.1

Bonds, Lien

7.3.4.4, 9.6.8, 9.10.2, 9.10.3

### Bonds, Performance, and Payment

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**, 11.1.3, **11.5**

### Building Information Models Use and Reliance

**1.8**

Building Permit

3.7.1

## Capitalization

**1.3**

Certificate of Substantial Completion

9.8.3, 9.8.4, 9.8.5

### Certificates for Payment

4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7,

9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.4

Certificates of Inspection, Testing or Approval  
13.4.4  
Certificates of Insurance  
9.10.2  
**Change Orders**  
1.1.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3,  
7.1.2, 7.1.3, 7.2, 7.3.2, 7.3.7, 7.3.9, 7.3.10, 8.3.1,  
9.3.1.1, 9.10.3, 10.3.2, 11.2, 11.5, 12.1.2  
**Change Orders, Definition of**  
7.2.1  
**CHANGES IN THE WORK**  
2.2.2, 3.11, 4.2.8, 7, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1,  
11.5  
**Claims, Definition of**  
15.1.1  
Claims, Notice of  
1.6.2, 15.1.3  
**CLAIMS AND DISPUTES**  
3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, 15, 15.4  
Claims and Timely Assertion of Claims  
15.4.1  
**Claims for Additional Cost**  
3.2.4, 3.3.1, 3.7.4, 7.3.9, 9.5.2, 10.2.5, 10.3.2, 15.1.5  
**Claims for Additional Time**  
3.2.4, 3.3.1, 3.7.4, 6.1.1, 8.3.2, 9.5.2, 10.3.2, 15.1.6  
**Concealed or Unknown Conditions, Claims for**  
3.7.4  
Claims for Damages  
3.2.4, 3.18, 8.3.3, 9.5.1, 9.6.7, 10.2.5, 10.3.3, 11.3,  
11.3.2, 14.2.4, 15.1.7  
Claims Subject to Arbitration  
15.4.1  
**Cleaning Up**  
3.15, 6.3  
Commencement of the Work, Conditions Relating to  
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3,  
6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.2, 15.1.5  
**Commencement of the Work, Definition of**  
8.1.2  
**Communications**  
3.9.1, 4.2.4  
Completion, Conditions Relating to  
3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1,  
9.10, 12.2, 14.1.2, 15.1.2  
**COMPLETION, PAYMENTS AND**  
9  
Completion, Substantial  
3.10.1, 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1,  
9.10.3, 12.2, 15.1.2  
Compliance with Laws  
2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 10.2.2,  
13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14.1.1, 14.2.1.3,  
15.2.8, 15.4.2, 15.4.3  
Concealed or Unknown Conditions  
3.7.4, 4.2.8, 8.3.1, 10.3  
Conditions of the Contract  
1.1.1, 6.1.1, 6.1.4

Consent, Written  
3.4.2, 3.14.2, 4.1.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 13.2,  
15.4.4.2  
**Consolidation or Joinder**  
15.4.4  
**CONSTRUCTION BY OWNER OR BY  
SEPARATE CONTRACTORS**  
1.1.4, 6  
**Construction Change Directive, Definition of**  
7.3.1  
**Construction Change Directives**  
1.1.1, 3.4.2, 3.11, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3,  
7.3, 9.3.1.1  
Construction Schedules, Contractor's  
3.10, 3.11, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2  
**Contingent Assignment of Subcontracts**  
5.4, 14.2.2.2  
**Continuing Contract Performance**  
15.1.4  
**Contract, Definition of**  
1.1.2  
**CONTRACT, TERMINATION OR  
SUSPENSION OF THE**  
5.4.1.1, 5.4.2, 11.5, 14  
Contract Administration  
3.1.3, 4, 9.4, 9.5  
Contract Award and Execution, Conditions Relating  
to  
3.7.1, 3.10, 5.2, 6.1  
Contract Documents, Copies Furnished and Use of  
1.5.2, 2.3.6, 5.3  
**Contract Documents, Definition of**  
1.1.1  
**Contract Sum**  
2.2.2, 2.2.4, 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.3, 7.4,  
9.1, 9.2, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.5, 12.1.2,  
12.3, 14.2.4, 14.3.2, 15.1.4.2, 15.1.5, 15.2.5  
**Contract Sum, Definition of**  
9.1  
Contract Time  
1.1.4, 2.2.1, 2.2.2, 3.7.4, 3.7.5, 3.10.2, 5.2.3, 6.1.5,  
7.2.1.3, 7.3.1, 7.3.5, 7.3.6, 7, 7, 7.3.10, 7.4, 8.1.1,  
8.2.1, 8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 12.1.2,  
14.3.2, 15.1.4.2, 15.1.6.1, 15.2.5  
**Contract Time, Definition of**  
8.1.1  
**CONTRACTOR**  
3  
Contractor, Definition of  
3.1, 6.1.2  
**Contractor's Construction and Submittal  
Schedules**  
3.10, 3.12.1, 3.12.2, 4.2.3, 6.1.3, 15.1.6.2  
Contractor's Employees  
2.2.4, 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6,  
10.2, 10.3, 11.3, 14.1, 14.2.1.1  
**Contractor's Liability Insurance**  
11.1

Contractor's Relationship with Separate Contractors and Owner's Forces  
 3.12.5, 3.14.2, 4.2.4, 6, 11.3, 12.2.4  
 Contractor's Relationship with Subcontractors  
 1.2.2, 2.2.4, 3.3.2, 3.18.1, 3.18.2, 4.2.4, 5, 9.6.2, 9.6.7, 9.10.2, 11.2, 11.3, 11.4  
 Contractor's Relationship with the Architect  
 1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.4, 15.1.3, 15.2.1  
 Contractor's Representations  
 3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2  
 Contractor's Responsibility for Those Performing the Work  
 3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8  
 Contractor's Review of Contract Documents  
 3.2  
 Contractor's Right to Stop the Work  
 2.2.2, 9.7  
 Contractor's Right to Terminate the Contract  
 14.1  
 Contractor's Submittals  
 3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3  
 Contractor's Superintendent  
 3.9, 10.2.6  
 Contractor's Supervision and Construction  
 Procedures  
 1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 7.3.6, 8.2, 10, 12, 14, 15.1.4  
 Coordination and Correlation  
 1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1  
 Copies Furnished of Drawings and Specifications  
 1.5, 2.3.6, 3.11  
 Copyrights  
 1.5, 3.17  
 Correction of Work  
 2.5, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, 12.2, 12.3, 15.1.3.1, 15.1.3.2, 15.2.1  
**Correlation and Intent of the Contract Documents**  
**1.2**  
**Cost, Definition of**  
**7.3.4**  
 Costs  
 2.5, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.4, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.2, 12.1.2, 12.2.1, 12.2.4, 13.4, 14  
**Cutting and Patching**  
**3.14, 6.2.5**  
 Damage to Construction of Owner or Separate Contractors  
 3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 12.2.4  
 Damage to the Work  
 3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 12.2.4  
 Damages, Claims for  
 3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.3.2, 11.3, 14.2.4, 15.1.7

Damages for Delay  
 6.2.3, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 14.3.2  
**Date of Commencement of the Work, Definition of**  
**8.1.2**  
**Date of Substantial Completion, Definition of**  
**8.1.3**  
**Day, Definition of**  
**8.1.4**  
 Decisions of the Architect  
 3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.4.2, 14.2.2, 14.2.4, 15.1, 15.2  
**Decisions to Withhold Certification**  
 9.4.1, 9.5, 9.7, 14.1.1.3  
 Defective or Nonconforming Work, Acceptance, Rejection and Correction of  
 2.5, 3.5, 4.2.6, 6.2.3, 9.5.1, 9.5.3, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1  
 Definitions  
 1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1  
**Delays and Extensions of Time**  
**3.2, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, 8.3, 9.5.1, 9.7, 10.3.2, 10.4, 14.3.2, 15.1.6, 15.2.5**  
**Digital Data Use and Transmission**  
**1.7**  
 Disputes  
 6.3, 7.3.9, 15.1, 15.2  
**Documents and Samples at the Site**  
**3.11**  
**Drawings, Definition of**  
**1.1.5**  
 Drawings and Specifications, Use and Ownership of  
 3.11  
 Effective Date of Insurance  
 8.2.2  
**Emergencies**  
**10.4, 14.1.1.2, 15.1.5**  
 Employees, Contractor's  
 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.3, 14.1, 14.2.1.1  
 Equipment, Labor, or Materials  
 1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2  
 Execution and Progress of the Work  
 1.1.3, 1.2.1, 1.2.2, 2.3.4, 2.3.6, 3.1, 3.3.1, 3.4.1, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.6, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.1, 12.2, 14.2, 14.3.1, 15.1.4  
 Extensions of Time  
 3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2, 10.4, 14.3, 15.1.6, 15.2.5  
**Failure of Payment**  
 9.5.1.3, 9.7, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2  
 Faulty Work  
 (See Defective or Nonconforming Work)  
**Final Completion and Final Payment**  
 4.2.1, 4.2.9, 9.8.2, 9.10, 12.3, 14.2.4, 14.4.3

Financial Arrangements, Owner's

2.2.1, 13.2.2, 14.1.1.4

## **GENERAL PROVISIONS**

### **1**

#### **Governing Law**

##### **13.1**

Guarantees (See Warranty)

#### **Hazardous Materials and Substances**

10.2.4, **10.3**

Identification of Subcontractors and Suppliers

5.2.1

#### **Indemnification**

3.17, **3.18**, 9.6.8, 9.10.2, 10.3.3, 11.3

#### **Information and Services Required of the Owner**

2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10.1, 6.1.3, 6.1.4, 6.2.5,

9.6.1, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2,

14.1.1.4, 14.1.4, 15.1.4

#### **Initial Decision**

##### **15.2**

#### **Initial Decision Maker, Definition of**

1.1.8

Initial Decision Maker, Decisions

14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5

Initial Decision Maker, Extent of Authority

14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5

#### **Injury or Damage to Person or Property**

**10.2.8**, 10.4

Inspections

3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3,

9.9.2, 9.10.1, 12.2.1, 13.4

Instructions to Bidders

1.1.1

Instructions to the Contractor

3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.4.2

#### **Instruments of Service, Definition of**

##### **1.1.7**

Insurance

6.1.1, 7.3.4, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5,

##### **11**

Insurance, Notice of Cancellation or Expiration

11.1.4, 11.2.3

#### **Insurance, Contractor's Liability**

##### **11.1**

Insurance, Effective Date of

8.2.2, 14.4.2

#### **Insurance, Owner's Liability**

##### **11.2**

#### **Insurance, Property**

**10.2.5**, 11.2, 11.4, 11.5

Insurance, Stored Materials

9.3.2

## **INSURANCE AND BONDS**

### **11**

Insurance Companies, Consent to Partial Occupancy

9.9.1

Insured loss, Adjustment and Settlement of

11.5

Intent of the Contract Documents

1.2.1, 4.2.7, 4.2.12, 4.2.13

## **Interest**

### **13.5**

#### **Interpretation**

1.1.8, 1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1

Interpretations, Written

4.2.11, 4.2.12

Judgment on Final Award

15.4.2

#### **Labor and Materials, Equipment**

1.1.3, 1.1.6, **3.4**, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,

5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1,

10.2.4, 14.2.1.1, 14.2.1.2

Labor Disputes

8.3.1

Laws and Regulations

1.5, 2.3.2, 3.2.3, 3.2.4, 3.6, 3.7, 3.12.10, 3.13, 9.6.4,

9.9.1, 10.2.2, 13.1, 13.3.1, 13.4.2, 13.5, 14, 15.2.8,

15.4

Liens

2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8

Limitations, Statutes of

12.2.5, 15.1.2, 15.4.1.1

Limitations of Liability

3.2.2, 3.5, 3.12.10, 3.12.10.1, 3.17, 3.18.1, 4.2.6,

4.2.7, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.6.8, 10.2.5, 10.3.3,

11.3, 12.2.5, 13.3.1

Limitations of Time

2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7,

5.2, 5.3, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3,

9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15,

15.1.2, 15.1.3, 15.1.5

#### **Materials, Hazardous**

10.2.4, **10.3**

Materials, Labor, Equipment and

1.1.3, 1.1.6, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,

5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2,

10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2

Means, Methods, Techniques, Sequences and

Procedures of Construction

3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2

Mechanic's Lien

2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8

#### **Mediation**

8.3.1, 15.1.3.2, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1,

15.4.1.1

#### **Minor Changes in the Work**

1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1, **7.4**

## **MISCELLANEOUS PROVISIONS**

### **13**

#### **Modifications, Definition of**

##### **1.1.1**

Modifications to the Contract

1.1.1, 1.1.2, 2.5, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7,

10.3.2

#### **Mutual Responsibility**

##### **6.2**

## **Nonconforming Work, Acceptance of**

9.6.6, 9.9.3, **12.3**

Nonconforming Work, Rejection and Correction of  
2.4, 2.5, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4,  
12.2

## **Notice**

**1.6**, 1.6.1, 1.6.2, 2.1.2, 2.2.2., 2.2.3, 2.2.4, 2.5, 3.2.4,  
3.3.1, 3.7.4, 3.7.5, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 7.4,  
8.2.2 9.6.8, 9.7, 9.10.1, 10.2.8, 10.3.2, 11.5, 12.2.2.1,  
13.4.1, 13.4.2, 14.1, 14.2.2, 14.4.2, 15.1.3, 15.1.5,  
15.1.6, 15.4.1

Notice of Cancellation or Expiration of Insurance  
11.1.4, 11.2.3

## **Notice of Claims**

1.6.2, 2.1.2, 3.7.4, 9.6.8, 10.2.8, **15.1.3**, 15.1.5,  
15.1.6, 15.2.8, 15.3.2, 15.4.1

Notice of Testing and Inspections

13.4.1, 13.4.2

Observations, Contractor's

3.2, 3.7.4

Occupancy

2.3.1, 9.6.6, 9.8

Orders, Written

1.1.1, 2.4, 3.9.2, 7, 8.2.2, 11.5, 12.1, 12.2.2.1, 13.4.2,  
14.3.1

## **OWNER**

**2**

**Owner**, Definition of

### **2.1.1**

**Owner**, Evidence of Financial Arrangements

**2.2**, 13.2.2, 14.1.1.4

**Owner**, Information and Services Required of the

2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5,  
9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1,  
13.4.2, 14.1.1.4, 14.1.4, 15.1.4

**Owner's** Authority

1.5, 2.1.1, 2.3.32.4, 2.5, 3.4.2, 3.8.1, 3.12.10, 3.14.2,  
4.1.2, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1,  
7.3.1, 8.2.2, 8.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2,  
10.3.2, 11.4, 11.5, 12.2.2, 12.3, 13.2.2, 14.3, 14.4,  
15.2.7

**Owner's** Insurance

### **11.2**

**Owner's** Relationship with Subcontractors

1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2

**Owner's** Right to Carry Out the Work

**2.5**, 14.2.2

**Owner's** Right to Clean Up

### **6.3**

**Owner's** Right to Perform Construction and to  
Award Separate Contracts

### **6.1**

**Owner's** Right to Stop the Work

### **2.4**

**Owner's** Right to Suspend the Work

14.3

**Owner's** Right to Terminate the Contract

14.2, 14.4

## **Ownership and Use of Drawings, Specifications and Other Instruments of Service**

1.1.1, 1.1.6, 1.1.7, **1.5**, 2.3.6, 3.2.2, 3.11, 3.17, 4.2.12,  
5.3

**Partial** Occupancy or Use

9.6.6, **9.9**

**Patching**, Cutting and

**3.14**, 6.2.5

Patents

3.17

**Payment**, Applications for

4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1,  
14.2.3, 14.2.4, 14.4.3

**Payment**, Certificates for

4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1,  
9.10.3, 14.1.1.3, 14.2.4

**Payment**, Failure of

9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2

**Payment**, Final

4.2.1, 4.2.9, **9.10**, 12.3, 14.2.4, 14.4.3

**Payment** Bond, Performance Bond and

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**

**Payments**, Progress

**9.3**, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4

## **PAYMENTS AND COMPLETION**

**9**

**Payments** to Subcontractors

5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2

PCB

10.3.1

**Performance** Bond and **Payment** Bond

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**

**Permits**, Fees, Notices and Compliance with Laws

2.3.1, **3.7**, 3.13, 7.3.4.4, 10.2.2

## **PERSONS AND PROPERTY, PROTECTION**

**OF**

**10**

Polychlorinated Biphenyl

10.3.1

**Product** Data, Definition of

**3.12.2**

**Product** Data and Samples, Shop Drawings

3.11, **3.12**, 4.2.7

**Progress** and **Completion**

4.2.2, **8.2**, 9.8, 9.9.1, 14.1.4, 15.1.4

**Progress** Payments

**9.3**, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4

**Project**, Definition of

**1.1.4**

**Project** Representatives

4.2.10

**Property** Insurance

10.2.5, **11.2**

**Proposal** Requirements

1.1.1

## **PROTECTION OF PERSONS AND PROPERTY**

**10**

Regulations and Laws  
1.5, 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14, 15.2.8, 15.4  
Rejection of Work  
4.2.6, 12.2.1  
Releases and Waivers of Liens  
9.3.1, 9.10.2  
Representations  
3.2.1, 3.5, 3.12.6, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.10.1  
Representatives  
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.10, 13.2.1  
Responsibility for Those Performing the Work  
3.3.2, 3.18, 4.2.2, 4.2.3, 5.3, 6.1.3, 6.2, 6.3, 9.5.1, 10  
Retainage  
9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3  
**Review of Contract Documents and Field Conditions by Contractor**  
**3.2, 3.12.7, 6.1.3**  
Review of Contractor's Submittals by Owner and Architect  
3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2  
Review of Shop Drawings, Product Data and Samples by Contractor  
3.12  
**Rights and Remedies**  
1.1.2, 2.4, 2.5, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.1, 12.2.2, 12.2.4, 13.3, 14, 15.4  
**Royalties, Patents and Copyrights**  
**3.17**  
Rules and Notices for Arbitration  
15.4.1  
**Safety of Persons and Property**  
**10.2, 10.4**  
**Safety Precautions and Programs**  
3.3.1, 4.2.2, 4.2.7, 5.3, 10.1, 10.2, 10.4  
**Samples, Definition of**  
**3.12.3**  
**Samples, Shop Drawings, Product Data and**  
3.11, 3.12, 4.2.7  
**Samples at the Site, Documents and**  
**3.11**  
**Schedule of Values**  
**9.2, 9.3.1**  
Schedules, Construction  
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2  
Separate Contracts and Contractors  
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2  
**Separate Contractors, Definition of**  
**6.1.1**  
**Shop Drawings, Definition of**  
**3.12.1**  
**Shop Drawings, Product Data and Samples**  
3.11, 3.12, 4.2.7  
**Site, Use of**  
**3.13, 6.1.1, 6.2.1**

Site Inspections  
3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.9.2, 9.4.2, 9.10.1, 13.4  
Site Visits, Architect's  
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4  
Special Inspections and Testing  
4.2.6, 12.2.1, 13.4  
**Specifications, Definition of**  
**1.1.6**  
**Specifications**  
1.1.1, 1.1.6, 1.2.2, 1.5, 3.12.10, 3.17, 4.2.14  
Statute of Limitations  
15.1.2, 15.4.1.1  
Stopping the Work  
2.2.2, 2.4, 9.7, 10.3, 14.1  
Stored Materials  
6.2.1, 9.3.2, 10.2.1.2, 10.2.4  
**Subcontractor, Definition of**  
**5.1.1**  
**SUBCONTRACTORS**  
**5**  
Subcontractors, Work by  
1.2.2, 3.3.2, 3.12.1, 3.18, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7  
**Subcontractual Relations**  
**5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1**  
Submittals  
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.4, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3  
Submittal Schedule  
3.10.2, 3.12.5, 4.2.7  
**Subrogation, Waivers of**  
**6.1.1, 11.3**  
**Substances, Hazardous**  
**10.3**  
**Substantial Completion**  
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 15.1.2  
**Substantial Completion, Definition of**  
**9.8.1**  
Substitution of Subcontractors  
5.2.3, 5.2.4  
Substitution of Architect  
2.3.3  
Substitutions of Materials  
3.4.2, 3.5, 7.3.8  
**Sub-subcontractor, Definition of**  
**5.1.2**  
Subsurface Conditions  
3.7.4  
**Successors and Assigns**  
**13.2**  
**Superintendent**  
**3.9, 10.2.6**  
**Supervision and Construction Procedures**  
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.4



Suppliers  
1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.5.4, 9.6,  
9.10.5, 14.2.1  
Surety  
5.4.1.2, 9.6.8, 9.8.5, 9.10.2, 9.10.3, 11.1.2, 14.2.2,  
15.2.7  
Surety, Consent of  
9.8.5, 9.10.2, 9.10.3  
Surveys  
1.1.7, 2.3.4

#### **Suspension by the Owner for Convenience**

##### **14.3**

Suspension of the Work  
3.7.5, 5.4.2, 14.3  
Suspension or Termination of the Contract  
5.4.1.1, 14

#### **Taxes**

3.6, 3.8.2.1, 7.3.4.4

#### **Termination by the Contractor**

##### **14.1, 15.1.7**

#### **Termination by the Owner for Cause**

5.4.1.1, 14.2, 15.1.7

#### **Termination by the Owner for Convenience**

##### **14.4**

Termination of the Architect  
2.3.3  
Termination of the Contractor Employment  
14.2.2

### **TERMINATION OR SUSPENSION OF THE CONTRACT**

#### **14**

#### **Tests and Inspections**

3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3,  
9.9.2, 9.10.1, 10.3.2, 12.2.1, 13.4

#### **TIME**

##### **8**

#### **Time, Delays and Extensions of**

3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, 8.3, 9.5.1, 9.7,  
10.3.2, 10.4, 14.3.2, 15.1.6, 15.2.5

#### **Time Limits**

2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2,  
5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3,  
9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14,  
15.1.2, 15.1.3, 15.4

#### **Time Limits on Claims**

3.7.4, 10.2.8, 15.1.2, 15.1.3

#### **Title to Work**

9.3.2, 9.3.3

### **UNCOVERING AND CORRECTION OF WORK**

#### **12**

#### **Uncovering of Work**

##### **12.1**

Unforeseen Conditions, Concealed or Unknown

3.7.4, 8.3.1, 10.3

Unit Prices

7.3.3.2, 9.1.2

Use of Documents

1.1.1, 1.5, 2.3.6, 3.12.6, 5.3

#### **Use of Site**

3.13, 6.1.1, 6.2.1

#### **Values, Schedule of**

9.2, 9.3.1

Waiver of Claims by the Architect

13.3.2

Waiver of Claims by the Contractor

9.10.5, 13.3.2, 15.1.7

Waiver of Claims by the Owner

9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.3.2, 14.2.4, 15.1.7

Waiver of Consequential Damages

14.2.4, 15.1.7

Waiver of Liens

9.3, 9.10.2, 9.10.4

#### **Waivers of Subrogation**

6.1.1, 11.3

#### **Warranty**

3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.2, 9.10.4, 12.2.2,  
15.1.2

Weather Delays

8.3, 15.1.6.2

#### **Work, Definition of**

##### **1.1.3**

Written Consent

1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.10.3,  
13.2, 13.3.2, 15.4.4.2

Written Interpretations

4.2.11, 4.2.12

Written Orders

1.1.1, 2.4, 3.9, 7, 8.2.2, 12.1, 12.2, 13.4.2, 14.3.1

## ARTICLE 1 GENERAL PROVISIONS

### § 1.1 Basic Definitions

#### § 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, the Contractor's Bid, University's Bid Solicitation, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. The Contract Documents shall include the Requirements as outlined specifically in the Bid Solicitation.

#### § 1.1.2 The Contract

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

**§1.1.2.1** The Contractor acknowledges and warrants that it has closely examined all of the Contract Documents, that they are suitable and sufficient to enable the Contractor to complete the Work in a timely manner for the Contract Sum, and that they include all Work, whether or not shown or described, which reasonably may be inferred to be required or useful for the completion of the Work in full compliance with all applicable codes, laws, ordinances and regulations and that questions regarding the bid documents and any interpretation(s) regarding same have been asked by the contractor, in the form and manner required in the instructions to bidders.

#### § 1.1.3 The Work

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

**§1.1.3.2** Nothing in these General Conditions shall be interpreted as imposing on either the Owner or Architect/Engineer, or its respective agents, employees, officers, directors or consultants, any duty, obligation or authority with respect to any items that are not intended to be incorporated into the completed project, including but not limited to shoring, scaffolding, hoists, temporary weatherproofing, or any temporary facility or temporary activity, since these are the sole responsibility of the Contractor.

#### § 1.1.4 The Project

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

#### § 1.1.5 The Drawings

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

#### § 1.1.6 The Specifications

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

#### § 1.1.7 Instruments of Service

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

#### § 1.1.8 Initial Decision Maker

The Initial Decision Maker is the Architect. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

1.1.9 Contracting Officer means the individual authorized, as an officer of the University, to administer the design, engineering and construction of all University buildings and facilities. He/she is the procuring contracting officer representing the University personally or through University's project managers in all relationships with contractors, consultants and architects/engineers. This includes a duly appointed successor or an authorized administrative contracting officer (ACO) acting within the limits of his/her authority. The contracting officer is the interpreter of the conditions of the contract and the judge of its performance. He/she shall not take arbitrary positions benefiting either the University or the contractor but shall use his/her powers under the contract to enforce its faithful performance by both.

1.1.10 "Final Completion" shall mean the date the project, including all punch list items properly performed by the contractor, all warranties have been transferred to the University and the Contractor has demobilized from the site.

1.1.11 Substantial Completion: The date the building or facility is operational or capable of serving its intended use even though all permanent installations are not in place. The determination as to the date of substantial completion shall be made pursuant to Article 8.3 of the General Conditions and other applicable Sections in the Project Manual.

§ 1.1.12 The word "contractor" shall mean the prime contractor(s) with whom the contract has been executed.

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

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

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

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

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

#### § 1.3 Capitalization

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

#### § 1.4 Interpretation

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

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

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or

**Commented [CEG1]:** Does Rowan typically hold ownership of the Instruments of Service?

distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

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

**§ 1.6 Notice**

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

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

**§ 1.7 Digital Data Use and Transmission**

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

**§ 1.8 Building Information Models Use and Reliance**

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™-2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™-2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

**§ 1.9 EXECUTION OF CONTRACT DOCUMENTS**

**§ 1.9.1** The Contract Documents shall be signed by the Owner and Contractor. The Agreement shall be signed in not less than duplicate by the Owner and Contractor.

**§ 1.9.2** Execution of the Contract by the Contractor is a representation that said Contract Documents are full and complete, are sufficient to have enabled the Contractor to determine the cost of the Work therein to enter into the Contract and that the Contract Documents are sufficient to enable it to perform the Work outlined therein, and otherwise to fulfill all its obligations hereunder, including, but not limited to, Contractor's obligation to perform the Work for an amount not in excess of the Contract Sum on or before the date(s) of Substantial Completion established in the Agreement. The Contractor further acknowledges and declares that it has visited and examined the site, examined all physical, legal, and other conditions affecting the Work and is fully familiar with all of the conditions thereon and thereunder affecting the same. In connection with the foregoing, and having carefully examined all Contract Documents, as aforesaid, and having visited the site, the contractor acknowledges and declares that it has no knowledge of any discrepancies, omissions, ambiguities, or conflicts in said Contract Documents and that if it becomes aware of any such discrepancies, omissions, ambiguities, or conflicts, it will promptly notify Owner and Engineer of such fact.

**1.9.3.** The term "reasonably inferable" includes work necessary to provide work indicated or specified, as defined in section: Definitions and Standards; that is: furnish and install, complete, in place and ready for use.

**1.9.3.1** Details referenced to portions of the Work shall apply to other like portions of the Work not otherwise detailed.

- 1.9.3.2 The Contractor shall request, from the Architect/Engineer interpretation of apparent discrepancies, conflicts, or omissions in the Specifications and Drawings. Subcontractors shall forward such requests through the Contractor. Such requests, and the Engineer's interpretation, shall be in written form; other forms of communications shall be used to expedite resolution of concerns, but will not be binding.
- § 1.9.4 Explanatory notes shall take precedence over conflicting drawn note indications. Large scale drawings shall take precedence over small scale drawings. Figured dimensions shall take precedence over scaled measurements. Should contradictions be found, the Engineer shall determine which indication is correct.
- § 1.9.5 Where it is required in the specifications that materials, products, processes, equipment, or the like be installed or applied in accordance with manufacturers' instructions, directions, or specifications, or words to this effect, it shall be construed to mean that said application or installation shall be in strict accordance with printed material concerned for use under conditions similar to those at the job site. Three copies of such instructions shall be furnished to the Engineer and his written approval thereof obtained before work is begun.
- § 1.9.6 Any material specified by reference to the number, symbol, or title of a Commercial Standard, Federal Specification, ASTM Specification, trade association standard, or other similar standards, shall comply with the requirements in the latest revision thereof and any amendments or supplements thereto in effect one month prior to the date on which bids are opened and read, except as limited to type, class, or grade, or modified in such reference. The standards referred to, except as modified in the specifications, shall have full force and effect as though printed in the specifications. The Engineer will furnish upon request information as to how copies of the standards referred to may be obtained.

## ARTICLE 2 OWNER

### § 2.1 General

§ 2.1.1 The Owner is Rowan University and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative. Contractor understands and acknowledges that the authority for all decisions required to be made resides with Owner. Contractor shall not rely upon or request from Architect/Engineer any decision which requires Owner's determination.

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

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

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

Intentionally Omitted.

§ 2.3.2 If applicable, the Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The furnishing of these surveys and the legal description of the site shall not relieve the Contractor from its duties under the Contract Documents. Neither Owner nor the Architect/Engineer shall be required to furnish Contractor with any information concerning subsurface characteristics or conditions of the areas where the Work is to be performed. When the Owner or Architect/Engineer has made investigations of subsurface characteristics or conditions of the areas where the Work is to be performed, such investigations, if any, were made solely for the purposes of Owner's study. Neither such

investigations nor the records thereof are a part of the Contract between Owner and Contractor. To the extent such investigations or the records thereof are made available to Contractor by the Owner or Architect/Engineer, such information is furnished solely for the convenience of Contractor. Neither Owner nor Architect/Engineer assumes any responsibility whatsoever in respect of the sufficiency or accuracy of the investigations thus made, the records thereof, or of the interpretations set forth therein or made by the Owner or Architect/Engineer in its use thereof, and there is no warranty or guaranty, either express or implied, that the conditions indicated by such investigations or records thereof are representative of those existing throughout the areas where the Work is to be performed, or any part thereof, or that unforeseen developments may not occur, or that materials other than or in proportions different from those indicated may not be encountered. The Contractor shall undertake such further investigations and studies as may be necessary or useful to determine subsurface characteristics and conditions. In connection with the foregoing, Contractor shall be solely responsible for locating (and shall locate prior to performing any Work) all utility lines, telephone company lines and cables, sewer lines, water pipes, gas lines, electrical lines, including, without limitation, all buried pipelines and buried telephone cables and shall perform the Work in such a manner so as to avoid damaging any such lines, cables, pipes, and pipelines.

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

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

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, or 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 fails to remove and discharge (within three days) any lien filed upon Owner's property by anyone claiming by, through, or under Contractor, or disregards the instructions of Architect or Owner when based on the requirements of the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.

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

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

### ARTICLE 3 CONTRACTOR

#### § 3.1 General

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

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

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

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

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. In addition to Contractor's duties under this Agreement, the Contractor shall carefully study and compare the Contract Documents with each other and shall at once report to the Owner errors, inconsistencies or omissions discovered. If the Contractor performs any construction activity involving an error, inconsistency or omission in the Contract Documents that the Contractor recognized or reasonably should have recognized without such notice to the Owner, the Contractor shall assume complete responsibility for such performance and shall bear the full amount of the attributable costs for correction. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

3.2.2.1 In the event of a conflict between provisions of the contract documents, the documents shall take precedence in the following order:

- (a) Executed Contract
- (b) Addenda
- (c) Supplemental General Conditions
- (d) General Conditions
- (e) Specifications
- (f) Drawings in the following order of precedence:
  - (1) notes on drawings
  - (2) large scale details
  - (3) figured dimensions
  - (4) scaled dimensions

Where there may be a conflict not resolvable by application of the provisions of this paragraph, then the contractor shall accept the condition more favorable to the University. In the event the conflicting condition is one of physical materials, equipment and/or labor then the more expensive labor, materials or equipment shall be assumed to be required and shall be provided by the contractor.

3.2.3 On all work involving alterations, remodeling, repairs or installation within existing buildings, it shall be the responsibility of the contractor by personal inspection of the existing building, facility, plant or utility system to satisfy himself/herself as to the accuracy of any information given which may affect the quantity, size and/or quality of materials required for a satisfactorily completed contract whether or not such information is indicated on the drawings or is included in the specifications. All contracts shall include the cost of all material and labor required to complete the work.

3.2.4 Dimensions of the work shall not be determined by scale or rule and figured dimensions shall be followed at all times unless obvious discrepancies exist. The contractor shall verify all dimensions at the job site and shall take any and all measurements necessary to verify the drawings and to properly lay-out the work. Any discrepancies affecting the lay-out of the work shall be called to the Architect's/Engineer's attention. No work so affected shall proceed until such discrepancy is corrected and the Architect/Engineer provides written confirmation of the resolution to the University's project manager.

3.2.5 Where on any drawing a portion of the work is fully drawn and the remainder is indicated in outline form, the portions fully drawn shall apply to all other like portions of the work unless specifically indicated or specified otherwise.

3.2.6 All indications or notations 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 whether they appear in the work except where a contrary result is clearly indicated by the contract documents.



3.2.7 Where codes, standards, requirements and publications of public and private bodies are referred to in the specifications, references shall be understood to be to the latest revision prior to the date of receiving bids except where otherwise indicated.

3.2.8 Where no explicit quality or standards for materials or workmanship are established for work, such work is to be of good quality for the intended use.

3.2.9 All manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the manufacturer's written or printed directions and instructions unless otherwise indicated in the contract documents.

3.2.10 The mechanical, electrical and fire protection drawings are diagrammatic only and are not intended to show the alignment, physical locations or configurations of such work. Such work shall be coordinated by the Contractor and shall be installed to clear all obstructions, permit proper clearances for the work of other trades, satisfy all code requirements and present an orderly appearance where exposed at no additional cost to the Owner.

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

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

### § 3.3 Supervision and Construction Procedures

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

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

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

§ 3.3.4 Contractor shall be solely responsible for the means and methods of the work performed. Owner shall have no obligation, responsibility and/or liability with respect to any issues, claims or controversies arising out of the manner in which work is performed, nor shall the Owner be responsible and/or liable for any issue, claim or controversy arising out of Contractor's failure to operate consistent with OSHA or other safety standards.



§ 3.3.5 Regularly scheduled job meetings shall be held at a location and time convenient to the Owner's representatives, the Engineer and the Contractor. The Contractor shall attend such meetings, or be represented by a person in authority who can speak for and make decisions for the Contractor.

#### § 3.4 Labor and Materials

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

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

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

#### § 3.5 Warranty

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

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

#### § 3.6 Taxes

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

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

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

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

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

#### § 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly

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

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

### § 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1.

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

### § 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a full time competent superintendent, acceptable to the Owner, and necessary assistants who shall be in attendance at the Project site during performance of the Work and until final completion of all work, including all corrective and punch list items. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

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

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

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

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

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

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

**§ 3.11 Documents and Samples at the Site**

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

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

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

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

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

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

**3.12.4.1** Unless otherwise stated in the Contract Documents, all submittals shall be provided electronically to the Contracting Officer.

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

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

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

**§ 3.12.8** The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect/Engineer's

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

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

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

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

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

### § 3.13 Use of Site

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

§ 3.13.1 Location and weights of all equipment and materials and the Contractor intends to place on the site shall be submitted to the Owner for review.

§ 3.13.2 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 Contractor.

§ 3.13.3 The Contractor and any entity for whom the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner with the exception of those directed to be erected through the contract documents and those necessary for site safety or in an emergency.

§ 3.13.4 As required by the University's project manager, the contractor shall provide and maintain an eight foot (8') high temporary chain link fence with necessary posts and top rails to enclose the area at the job site and to guard and close effectively the designated area. The contractor shall be responsible for posting appropriate signage restricting

access and shall further be responsible for controlling access to the job site. All signage must follow University Design Standards and be approved by the project manager. The contractor shall provide gates at locations where required for access to the enclosed area. Gates shall be of chain link material, cross-braced, hung on heavy strap hinges and shall have suitable hasps and padlocks.

§ 3.13.5 The contractor shall remove the fence upon completion of the work or at such time before final completion as directed by the University.

§ 3.13.6 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 provision of the Contract Documents, Contractor shall use its best efforts to minimize any interference with the occupancy or beneficial use of (1) any areas and buildings adjacent to the site of the Work.

§ 3.13.7 Without prior approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project site, including without limitation, 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 all 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.

§ 3.13.8 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 the problems of such and suggest alternatives through which the same results can be achieved. The Owner may, in the Owner's sole discretion, adopt such suggestions, develop new alternatives or require compliance with the existing requirement of the rules and regulations. The Contractor shall also comply with all insurance requirements and collective bargaining agreements applicable to use and occupancy of the Project site and the Building.

#### § 3.14 Cutting and Patching

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

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

#### § 3.15 Cleaning Up

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

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

§ 3.15.3 Rowan University is a smoke free campus, and Contractor shall not allow its employees, agents, representatives, subcontractors, workers, etc., to smoke on the site or while on Rowan University property.

#### § 3.16 Access to Work

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

#### § 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but

shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

### § 3.18 Indemnification

#### § 3.18.1

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

- .1 Contractor, for itself, its successors and assigns, agrees to indemnify and save Owner, the individual members (past, present and future), its successors, assigns, employees, agent, Engineers, and/or the harmless from, and against any and all claims, demands, damages, actions or causes of action by any party, together with any and all losses, costs or expenses in connection therewith or related thereto, including, but not limited to, attorney fees and costs of suit, for bodily injuries, death or property damage arising in or in any manner growing out of the work performed, or to be performed under this Contract. Contractor and its successors and assigns agree to indemnify the Owner, its individual members (past, present and future), its successors, assigns, employees, agents, and Engineers and against all fines, penalties or losses incurred for, including, but not limited to, attorney fees and costs of suit, or by reason of the violation by Contractor in the performance of this Contract, or any ordinance, regulation, rule of law of any political subdivision or duly constituted public authority. Without limiting the foregoing, the Contractor, at the request of Owner, its individual members (past and present), its successors, assigns, employees, agents, or Engineers, agrees to defend at the Contractor's expense any suit or proceeding brought against Owner, its individual members (past, present and future), its successors, assigns, employees, agents, Engineers due to, or arising out of the work performed by the Contractor.
- .2 The Contractor assumes the entire risk, responsibility, and liability for any and all damage or injury of every kind and nature whatsoever (including death resulting therefrom) to all persons, whether employees of the Contractor or otherwise, and to all property (including the Work itself) caused by, resulting from, arising out of or occurring in connection with the execution of the Work, or in preparation for the Work, or any extension, modification, or amendment to the Work by the Change Order or otherwise. To the fullest extent permitted by law, the Contractor and its Surety shall indemnify and save harmless the Owner, the Architect, the Architect's consultants, and the respective agents and employees of any of them (herein collectively called the Indemnitees) from and against any and all liability, loss, damages, interest, judgments, and liens growing out of, and any and all costs and expenses (including, but not limited to, counsel fees and disbursements) arising out of, relating to or incurred in connection with the Work including, any and all claims, demands, suits, actions, or proceedings which may be made or brought against any of the Indemnitees for or in relation to any breach of the Contract for Construction or any violation of the laws, statutes, ordinances, rules, regulations, or executive orders relating to or in any way affecting the performance or breach of the Contract for Construction, whether or not such injuries to persons or damages to property are due or claimed to be due, in whole or in part, to any negligence of the Contractor or its employees, agents, subcontractors, or materialmen, excepting only such injuries and/or damages as are the result of the sole gross negligence of the Owner or Architect.

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

damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

#### ARTICLE 4 ARCHITECT/ENGINEER

##### § 4.1 General

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

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

##### § 4.2 Administration of the Contract

§ 4.2.1 The Owner will provide administration of the Contract, through its Contracting Officer, as described in the Contract Documents during construction until the date the Architect/Engineer or Contracting Officer issues the final Certificate for Payment. The Architect/Engineer or Contracting Officer will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

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

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

##### § 4.2.4 Communications

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

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

§ 4.2.6 The Architect/Engineer has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect/Engineer considers it necessary or advisable, the Architect/Engineer will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect/Engineer 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/Engineer to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

**Commented [CEG2]:** How does Rowan want to handle the administration of the contract? IS it always the Contracting Officer



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

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

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

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

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

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

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

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

## ARTICLE 5 SUBCONTRACTORS

### § 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

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



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

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

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

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

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

#### § 5.3 Subcontractual Relations

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

#### § 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Where applicable subcontract agreement for a portion of the Work assigned by the Contractor to the Owner, will not be valid unless:

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

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

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

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity.

## **ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**

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

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

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

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

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

### **§ 6.2 Mutual Responsibility**

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

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

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

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

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

### **§ 6.3 Owner's Right to Clean Up**

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

## ARTICLE 7 CHANGES IN THE WORK

### § 7.1 General

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

7.1.1.1 A field directive or field order shall not be recognized as having any impact upon the Contract Sum or the Contract Time and the Contractor shall have no claim therefor unless it shall, prior to complying with same and in no event no later than 10 working days from the date such direction or order was given, submit in writing to the Owner for the Owner's approval its change proposal.

7.1.1.2 When submitting its change proposal, the Contractor shall include and set forth in clear and precise detail breakdowns of labor and materials for all trades involved and the estimated impact on the construction schedule. The Contractor shall furnish spread sheets from which the breakdowns were prepared, plus spread sheets if requested of any Subcontractors.

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

§ 7.1.2.1 Neither this Contract nor the Work to be performed hereunder can be changed by oral agreement. No course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work and no claims that the Owner has been unjustly enriched by any alteration or addition to the Work, whether there is, in fact, any unjust enrichment to the Work, shall be the basis for any alleged implied agreement by the Owner to the change, any alleged waiver of the Owner's right under this Contract or any increase in any amounts due under the Contract or any or a change in any time period provided for in the Contract Documents.

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

§ 7.1.4 A directive or order from the owner or the Engineer, other than a change order, a construction change directive or any order for a minor change pursuant to this article 7, shall not be recognized as having any impact on the contract sum or the contract time and the contractor shall have no claim therefore. If the contractor believes that a directive or order would require it to perform work not required by the contract documents, the contractor shall so inform the owner in writing prior to complying with the same and in no event any later than five (5) working days from the day such direction or order was given, and shall submit to the owner for the owner's approval its change proposal.

### § 7.2 Change Orders

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

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

§ 7.2.2 Change Order shall include all costs, including cost of preparation of the change order, all impact and ripple costs associated with modifications or delays to the work an assessment of the amount and impact of any perceived potential delays, and all costs associated with modifications to other work.

.1 The Prime Contractor shall furnish all necessary documentation to support the additional cost, including but not limited to the following:

- .1 Copy of subcontractor's proposal.
- .2 Complete breakdown for all costs for labor and material.
- .3 Complete breakdown of related costs.
- .4 Other information as may be requested by the Owner.

§ 7.2.3 The overall cost of the Change Order shall be inclusive and once accepted by the Owner it shall be considered full and final.

§ 7.2.4 No additional time will be granted to the Contractor for minor change orders unless each individual change order totals more than \$50,000.

**Commented [CEG3]:** We should remind PMs that for any deduct change order, they should be aware and conscious of deducting OP.

§ 7.2.5 When a Change Order involves both additions and deletions in material, the net quantity is to be determined and the appropriate overhead and profit is to be applied to the net quantity.

§ 7.2.6 When any change in the Work, regardless of the reason therefore, requires or is alleged to require an adjustment in Contract Time, such request for time adjustment shall be submitted by the Contractor as part of the change proposal. Any Change Order approved by the Owner and for which payment is accepted by the Contractor, in which no adjustment in Contract Time is stipulated, shall be understood to mean that no such adjustment is required by reason of the change, and any and all rights of the Contractor or any subsequent request for adjustment of Contract Time by reason of the change is waived.

§ 7.2.7 Request by the Contractor for adjustment of the Contract Amount regardless of the reason therefore, shall be submitted to the Engineer and the Owner with itemized labor and material quantities and unit prices to permit proper evaluation of the request. A submission by the Contractor containing unsubstantiated lump sum requests for adjustment of the Contract Amount will not be considered by the Owner and Engineer. The Owner and Engineer will not be liable for any delay incurred by reason of the Contractor's failure to submit satisfactory justification and back-up with any request for adjustment to the Contract Amount.

§ 7.2.8 Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the initial Work which is the subject to the Change Order, including, but not limited to, all direct, indirect and impact costs associated with such change and any and all adjustment to the Contract Sum and the Construction Schedule. The Contractor will not be entitled to any compensation for additional work, impact costs or delays in the Construction Schedule not included in the Change Order.

### § 7.3 Construction Change Directives

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

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

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

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

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

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- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

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

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

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

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

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

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

#### § 7.4 Minor Changes in the Work

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

#### § 7.5 OVERTIME AUTHORIZED BY OWNER

§7.5.1 When work beyond the normal working hours for the trade is authorized by the Owner, for his own reasons, in writing, the Contract Sum shall be adjusted by Change Order on the basis of premium payment for labor only plus the actual extra cost for insurance and taxes based on this premium payment. Overhead and profit will not be paid by the Owner for overtime so authorized.

### ARTICLE 8 TIME

#### § 8.1 Definitions

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

§ 8.1.2 The work to be performed under this Contract shall commence on May 19<sup>th</sup> 2021.

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

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

#### § 8.2 Progress and Completion

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

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

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

§ 8.2.4 Owner, or his representative, in coordination with the Contractor, shall set work hours. Contractor may be required to work nights, weekends or holidays as necessary to complete the work in accordance with the Schedule or in coordination with School Activities. Under no circumstances shall the Contractor begin or continue with work that is adversely impacting School activity or operations. All utility shutdowns, interruptions, work in or adjacent to existing buildings will be coordinated through the Owner, or his representative, and may have to be performed during hours when the School is not in operation. All cutting, hammering or other activity that is noisy, produces smoke or fumes or is otherwise disruptive to the School may have to be done during hours when the School is not in operation. Work required to be performed during non-school operating hours, as determined by the Owner or his representative, will be performed at no additional cost to the Owner.

§ 8.2.5 Contractor agrees to increase manpower, increase work hours, and to increase equipment necessary to maintain the Project Construction Schedule, and when also requested by the Architect/Engineer and the Owner, and shall be without additional cost or charge to the Owner.

§8.2.5 Work shall commence immediately and shall proceed uninterrupted to Final Completion. The Contractor acknowledges and recognizes that the Owner is entitled to full and beneficial occupancy and use of all or part of the completed Work in accordance with the Milestone Dates set forth in other sections of the Contract Documents, as per approved Schedule, and that the Owner has made arrangements to discharge its public obligations based upon the Contractor's achieving Substantial Completion of all of the Work within the Contract Time. The Contractor further acknowledges and agrees that if the Contractor fails to complete substantially or causes a delay in the Substantial Completion of any portion of the Work as required by the Project Construction Schedule and/or within the Contract Time, the Owner will sustain extensive damages and serious loss as a result of such failure. The exact amount of such damages will be extremely difficult to ascertain. Therefore, the Owner and the Contractor agrees as set forth below.

- .1 If the Contractor fails to achieve partial completion within the requirements of the Milestone Dates or the approved Schedule or to achieve Substantial Completion of all or part of the Work when and as required by the Project Construction Schedule and/or within the Contract Time, the Owner shall be entitled to retain or recover from the Contractor and its Surety, as liquidated damages and not as a penalty, the amounts indicated in other sections of the Contract Documents and commencing upon the first day following expiration of the Project Construction Schedule and/or the Contract Time, as the case may be, and continuing until the actual Date of Substantial Completion.

#### §8.2.6 Adherence to Schedule

- .1 The Owner reserves the right to withhold monthly progress payments if the Contractor is behind schedule, unless the Contractor documents, in writing, any delays that are not the fault of the Contractor and to which the Owner and Engineer agree.
- .2 Monthly progress payments will only be released after the Contractor reaches the status of completion for that month contemplated by the construction schedule.

### § 8.3 Delays and Extensions of Time

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

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

§ 8.3.2.1 Any claim for extension of time should be made in writing to the Owner not more than five (5) days after the commencement of the delay, otherwise, it shall be waived. The Contractor shall provide an estimate of the probable effect of such delay on the progress of the work. No claim made beyond the five (5) days shall be considered valid.

§ 8.3.2.2 The Contractor agrees that if any delay in the Contractor's works unnecessarily delays the work of any other Contractor or Contractors, the Contractor shall in that case pay all costs and expenses incurred by such parties due to such delays and hereby authorizes the Owner to deduct the amount of such costs and expenses from any moneys due or to become due the Contractor under this Contract. The Owner shall be responsible for ascertaining whether the Contractor is responsible for delaying any of the work of any other Contractor. His decision shall be final.

§ 8.3.3 Notwithstanding anything to the contrary in the Contract Documents, any extension of the Contract Time, to the extent permitted under Paragraph 8.3.1., 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 (4) other similar claims (collectively referred to in this Paragraph 8.3.3. as "delays"), whether or not such delays are foreseeable, unless a delay is caused by acts of the Owner constituting 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 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 without limitation consequential damages, lost opportunity cost, impact damages or other similar remuneration. The Owner's exercise of any of its rights or remedies under the Contract Documents (including without limitation 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 an act of interference with the Contractor's performance of the Work

§ 8.3.4 The Contractor agrees that the Owner can deduct from the Contract Sum, any wages paid by the Owner to any Inspector or Engineer or other professional necessarily employed by the Owner for any number of days in excess of the number of days allowed in the specifications for completion of work..

§ 8.3.5 Where the cause of delay is due to weather conditions, an extension of time shall be granted only for unusually severe weather, as determined by reference to historical data. The term "historical data" as used in the previous sentence shall be construed according to this formula: Average rainfall (or snow or low temperature) for the past five years.

§ 8.3.3 The Contractor shall be precluded from the recovery of damages for delay or for any impacts resulting from delay. This preclusion shall apply for any delays described in paragraph 8.3.1, including (but not limited to) delays caused by an act or neglect on the part of the Owner or Engineer or of an employee of either. The Contractor's sole remedy for any delay (or resulting impacts) shall be an appropriate extension of time for the completion of the Contract. In the event that a Contractor asserts in an arbitration, lawsuit or proceeding of any type, an entitlement to money damages or other damages other than an extension of time in violation of this provision, the Owner and the Architect/Engineer shall be entitled to reasonable attorney's fees and costs incurred in the defense of that matter. Anything contained in the General Conditions of the Contract for Construction, AIA Document A201-2007 or as amended, the Supplementary Conditions, the Specifications, the Contract, the Drawings or any other document to the contrary notwithstanding, the Contractor shall not be entitled to damages or to extra compensation by reason of



delays occasioned by the proceedings to review the awarding of the Contract to the Contractor or to review the awarding of any other Contract to any other Contractor.

## **ARTICLE 9 PAYMENTS AND COMPLETION**

### **§ 9.1 Contract Sum**

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

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

### **§ 9.2 Schedule of Values**

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

### **§ 9.3 Applications for Payment**

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

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

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

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

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

### **§ 9.4 Certificates for Payment**

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



and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

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

**§ 9.5 Decisions to Withhold Certification**

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

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

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

- .1 If the Contractor disputes any determination by the Owner with regard to any Certificate of Payment, the Contractor nevertheless expeditiously shall continue to prosecute the Work.
- .2 The failure of the Owner to retain any percentage payable to the Contractor or any change in or variation of the time, method or condition of payments to the Contractor shall not release or discharge to any extent whatsoever the Surety upon any bond given by Contractor hereunder. The Owner shall have the right, but not the duty, to disregard any schedule of items and costs that the Contractor may have furnished and defer or withhold in whole or in part any payment if it appears to the Owner, in its sole discretion, that the balance available in the Contract Sum as adjusted and less retained percentages, may be insufficient to complete the Work.
- .3 Notwithstanding any provision of any law to the contrary, the Contractor agrees that the time and conditions for payment under the Contract for Construction shall be as stated in the Contract for Construction and in the Contract Documents. The Contractor specifically agrees that Owner's failure to give, or timely give, notice of:
  - .1 any error in an invoice or application for payment submitted by the Contractor for payment; or
  - .2 any deficiency or non-compliance with the Contract Documents with respect to any Work for which payment is requested, shall not waive or limit any of the Owner's rights or defenses under

the Contract for Construction and the Contract Documents, or require the Owner to make a payment in advance of the time, or in an amount greater than, as provided by the Contract for Construction.

.4 The Contractor shall make payments to its subcontractors in accordance with the provisions of any applicable law governing the time, conditions, or requirements for payment to its Subcontractors, and shall comply with the provisions of any such law.

- .1 The Contractor will pay its Subcontractors no later than (15) fifteen days after receipt of a payment from the Owner which includes payment for the work of any such Subcontractors.
- .2 The Contractor shall require its Subcontractors, by appropriate agreement, to pay their subcontractors and suppliers (of any tier) within the same time.
- .3 The Contractor and its Surety shall indemnify and defend the Owner any loss, cost, expenses, or damages including attorney's fees, arising from or relating to the Contractor's failure to comply with such law.

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

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

#### § 9.6 Progress Payments

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

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

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

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

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

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

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall

require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

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

#### **§ 9.7 Failure of Payment**

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

#### **§ 9.8 Substantial Completion**

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

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

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

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

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

#### **§ 9.9 Partial Occupancy or Use**

**§ 9.9.1** The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor

considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

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

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

**§ 9.10 Final Completion and Final Payment**

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

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

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

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

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

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

## 9.11 LIQUIDATED DAMAGES

§ 9.11.1 The Contractor understands and agrees that all work must be performed in an orderly and closely coordinated sequence so that the dates for substantial and Final completion are met.

§ 9.11.2 If the Contractor fails to complete his work or fails to complete a portion of his work, he shall pay the Owner, as liquidated damages and not as a penalty, the sum as specified in the technical portion of the contract documents. Such amount is agreed upon as a reasonable and proper measure which the Owner will sustain each calendar day by failure of the Contractor to complete work within the stipulated time. Liquidated damages shall also apply to all Phased construction milestone dates as established by the phasing plan

§ 9.11.3 Substantial completion will be recommended by the Architect/Engineer, and ultimately determined by the Owner..

§ 9.11.4 For damage occurring at the time of delay, the Owner may retain the amount due to him under this clause from any payments due to the Contractor.

§ 9.11.5 The Owner will suffer financial loss if the project is not substantially complete on the date set forth in the Contract Documents. The Contractor (and the Contractor's Surety) shall be liable for and pay to the Owner the sum of \$ 1,000.00 stipulated and fixed, agreed as liquidated damages for each calendar day of delay until the work is substantially complete.

§ 9.11.6 ONE THOUSAND (\$1,000.00) PER DAY **CALENDAR** DAY FOR PUNCH LIST ITEMS.

**Commented [CEG5]:** This number is a placeholder. PMs shall determine if LD's should be more (or in some instances, less).

## ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

### § 10.1 Safety Precautions and Programs

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

§ 10.1.1 The Contractor must fully comply with the job safety requirements in addition to all Federal, State and Local safety guidelines. All cost associated with complying with all safety requirements shall be included in the Contract.

### § 10.2 Safety of Persons and Property

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

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

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

§ 10.2.2.1 Contractor shall comply with all regulations required by the Federal Occupational Safety and Health Act (OSHA).

§ 10.2.2.2 The Contractor shall conform to all applicable New Jersey Department of Environmental Protection regulations.

§ 10.2.2.3 Contractors must comply with Construction and Environmental Standards contained in Federal and State

Regulations and other applicable laws.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities consistent with applicable laws, statutes, ordinances, codes, rules and regulations and lawful orders of public authorities, and prevailing industry practice.

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

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

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

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

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

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

§ 10.2.9 The Contractor shall provide and maintain in good operating condition suitable and adequate fire protection equipment, and shall comply with all reasonable recommendations regarding fire protection made by the representatives of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits under the Contractor's control shall be kept orderly and clean, and all combustible rubbish shall be promptly removed from the site. Contractor will comply with all reasonable requests of the Owner and Engineer with respect to additional security and protections required for work interfacing with School Operations. Safety is of utmost importance on this project and all issues relative to safety and protection of the School, Staff and Students will be treated as emergency needs and will not be subject to the 7-day notice requirements of Article 14.

§ 10.2.10 The Contractor shall remove snow or ice which may accumulate on the site within areas under his control which might result in damage or delay.

§ 10.2.11 The Contractor shall take all precautions necessary to prevent loss or damage caused by vandalism, theft, burglary, pilferage, or unexplained disappearance of property of the Owner and Contractor, whether or not forming part of the Work, located within those areas of the Project to which the Contractor has access. Whenever unattended, including nights and weekends, mobile equipment and operable machinery shall be kept locked and made inoperable and immovable.

§ 10.2.12 Neither the Owner and/or the Engineer shall be responsible for providing a safe working place for the Contractor, the Subcontractors or their employees, or any individual responsible to them for the work.

§ 10.2.13 The Contractor shall conform to requirements of OSHA, the Construction Safety Code of the State Department of Labor and those of the AGC Manual. The requirements of the New Jersey and Local Building Construction Codes shall apply where there are equal to or more restrictive than the requirements of the Federal Act.

§ 10.2.14 When all or a portion of the Work is suspended for any reason, the Contractor shall securely fasten down all coverings and protect the Work as necessary from injury or any cause.

§ 10.2.15 The Contractor shall promptly report in writing to the Owner and Engineer all accidents arising out of or in connection with the Work which caused death, personal injury or property damage giving full details and statements of any witnesses. In addition, if death, serious personal injury or serious property damage is caused, the accident shall be reported immediately by telephone or messenger to the Owner and Engineer.

§ 10.2.16 Contractor is required to follow and enforce the work rules set forth below. Failure to comply with or enforce any of these rules will be grounds for suspension and/or termination of this Contract:

- .1 No use of alcoholic beverages prior to or during working hours. Anyone found impaired after lunch will be escorted from the Project site.
- .2 No use of illegal drugs or prescription medications which could induce drowsiness or otherwise impair perception or performance. Use of illegal drugs may result in prosecution to the fullest extent of the law. Any warning associated with use of prescription drugs must be complied with, particularly warning against operation of machinery and equipment.
- .3 No horseplay or rough-housing will be allowed.
- .4 No sexual, racial, or ethnic harassment, or similar conduct will be tolerated.
- .5 All employees shall use proper sanitation habits including use of toilet facilities and garbage cans.
- .6 All employees shall dress in clothing appropriate for the work they are to perform. All personnel are to wear hardhats, safety shoes, glasses, gloves, masks or respirators, noise protection devices, and other protective clothing and equipment as required by OSHA standards.
- .7 All equipment is to be properly stored and/or secured at the end of the work day or if it is to remain idle for greater than one hour.
- .8 All personnel are to be made aware of the availability of Material Safety Data Sheets for materials used at the Project site. This information is available from the Contractor using the product. The Contractor shall maintain a copy of all MSDS forms at the construction site office for all personnel to review.

§ 10.2.17 Contractor shall protect adjoining private or municipal property and shall provide barricades, temporary fences and covered walkways required by prudent construction practices, local building codes, ordinances or other laws, or the Contract Documents.

10.2.18 In the event that contractor fails to comply with the provisions of the Section 10.2, the University may withhold from each invoice a percentage in addition to any other retainage required by the contract or the contract price in accordance with the following table:

When Total Contract Price Is:	Percentage to be Withheld Is:
Less than \$250,000	10%
\$250,000 to \$1,000,000	5%
Over \$1,000,000	2%

The withholding of any sums pursuant to this section shall not be construed as or constitute in any manner a waiver by the Owner of the contractor's obligation to comply with the provisions of this Section 10.2. In the event the contractor fails to comply with the provisions of this Section 10.2, the Owner shall have those rights and remedies provided by law and pursuant to this contract in addition to and not in lieu of the sums withheld in accordance with this section.

### § 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or



polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents.

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

#### § 10.4 Emergencies

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

### ARTICLE 11 INSURANCE AND BONDS

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

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

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

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

§ 11.1.4 **Notice of Cancellation or Expiration of Contractor's Required Insurance.** Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.



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

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

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss.

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

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

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

**ARTICLE 12 UNCOVERING AND CORRECTION OF WORK**

**§ 12.1 Uncovering of Work**

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

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

**§ 12.2 Correction of Work**

**§ 12.2.1 Before Substantial Completion**

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense. If prior to the date of Substantial Completion the Contractor, a subcontractor or anyone for whom either is responsible, uses or damages any portion of the Work, including without limitation, mechanical, electrical, plumbing and other building systems, machinery, equipment or other mechanical device, the Contractor shall cause each such item to be restored to "like new condition" at no expense to the Owner.

#### § 12.2.2 After Substantial Completion

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

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

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

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

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

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

#### § 12.3 Acceptance of Nonconforming Work

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

### ARTICLE 13 MISCELLANEOUS PROVISIONS

#### § 13.1 Governing Law

The Contract shall be governed by the law of the State of New Jersey and any dispute regarding the Contract shall be venued in Superior Court of New Jersey, Gloucester County.

#### § 13.2 Successors and Assigns

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

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

#### § 13.3 Rights and Remedies

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

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

#### § 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

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

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

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

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

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

#### § 13.5 Interest

§ 13.6.1. The Contractor shall not be entitled to any payment of interest for any reason, action or inaction by the Engineer or the Owner.

§ 13.6.2 Any payments withheld for time delays, faulty materials, or workmanship, shall not bear interest for period of delay or non-acceptance.

### ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

#### § 14.1 Termination by the Contractor

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

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment (without cause) within the time stated in the Contract Documents; or

§ 14.1.2 If one of the above reasons exist, the Contractor may, upon fourteen (14) days written notice to the Owner, terminate the Contract, unless this reason is cured prior to the expiration of the notice, and recover from the Owner payment of work properly executed in accordance with the Contract Documents (the basis for such payment shall be as provided in the Contract) and for payment for cost directly related to work thereafter performed by Contractor in terminating such work including reasonable demobilization and cancellation charges provided said work is authorized in advance by Architect and Owner.

§ 14.1.3 The Owner shall not be responsible for damages for loss of anticipated profits on work not performed on account of any termination described in Subparagraph 14.1.1 and 14.1.2.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

#### § 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 refuses or fails to supply enough properly skilled workers or proper materials and/or equipment;
- .2 fails to make prompt payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 disregards the instructions of Owner (when such instructions are based on the requirements of the Contract Documents).
- .5 Is adjudged bankrupt or insolvent, or makes a general assignment for the benefit of Contractor's creditors, or a trustee or a 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 recognize under bankruptcy or similar laws; or
- .6 Breaches any warranty made by the Contractor under or pursuant to the Contract Documents.
- .7 Fails to furnish the Owner with assurances satisfactory to the Owner evidencing the Contractor's ability to complete the Work in compliance with the requirements of the Contract Documents.
- .8 Fails after the commencement of the Work to proceed continuously with the construction and completion of the work for more than 10 days except as permitted under the Contract Documents.
- .9 Otherwise does not fully comply with the Contract Documents.

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

§ 14.2.4 If the costs of finishing the Work, including compensation for the services of any consultants and the Architect's services and expenses made necessary thereby, and the other costs and expenses identified hereinafter, exceed the unpaid balance of the Contract Sum, the contractor and its Surety shall pay the difference to the Owner upon demand. The costs of finishing the Work include, without limitation, all reasonable attorney's fees, additional title costs, insurance, additional interest because of any delay in completing the Work, and all other direct and indirect consequential costs, including, without limitation, Liquidated Damages for untimely completion as specified in the Contract Documents, incurred by the Owner by reason of, or arising from, or relating to the termination of the Contractor as stated herein

#### § 14.3 Suspension by the Owner for Convenience

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

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

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

#### § 14.4 Termination by the Owner for Convenience

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

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

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

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to Owner payment for Work performed as of the date of termination in accordance with the contract Documents. The Contractor shall, as a condition of receiving the payments referred to herein, execute and deliver all such papers, turn over all plans, documents and files of whatsoever nature required by the Owner, and take all such steps, including the legal assignment of its contractual rights, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Contractor. The Contractor warrants that it will enter into no subcontracts or other agreements that would adversely impact the Owner's rights or increase the Owner's obligations under this paragraph. In no event shall the Owner be liable to the Contractor for lost or anticipated profits or consequential damages, or for any amount in excess of the compensation due to the Contractor in accord with the Contract Documents for the Work performed as of the date of termination. The warranty and indemnity obligations of the Contractor and Surety shall survive and continue, notwithstanding any termination pursuant to this paragraph, with respect to the Work performed as of the date of termination.

§ 14.4.4 If Owner terminates the Contract for cause pursuant to Paragraph 14.2 and it is subsequently determined that the Owner was not authorized to terminate the Contract as provided in Paragraph 14.2, the Owner's termination shall be treated as a termination for convenience under this Paragraph 14.4 and the rights and obligations of the parties shall be the same as if the Owner has issued a notice of termination to the Contractor as provided in this Paragraph 14.4

#### ARTICLE 15 CLAIMS AND DISPUTES

##### § 15.1 Claims

###### § 15.1.1 Definition

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

###### § 15.1.2 Time Limits on Claims

Issues involving the applicable statute of limitations shall be governed by New Jersey Law.

§ 13.7.1 No act or omission by the Owner or Engineer, or by anyone acting on behalf of either shall be deemed or construed as a waiver or limitation of any right or remedy under the Contract Documents, or as an admission, acceptance, or approval with respect to any breach of the Contract for Construction or failure to comply with the Contract Documents by the Contractor, unless the Owner expressly agrees, in writing.

§ 13.7.2 The Owner's exercise, or failure to exercise, any rights, claims or remedies it may have arising out of or relating to the Contract documents shall not release, prejudice, or discharge the Owner's other rights and remedies, nor shall it give rise to any right, claim, remedy or defense by any other person, including the Contractor, its Surety, any Subcontractor, or any other person or entity.

§ 13.7.3 Whenever possible, each provision of the Contract Documents shall be interpreted in a manner as to be effective and valid under applicable law. If, however, any provision of the Contract Documents, or portion thereof, is prohibited or found invalid by law, only such invalid provision or portion thereof shall be ineffective, and shall not invalidate or affect the remaining provision of the Contract Documents or valid portions of such provision, which shall be deemed severable. Further, if any provision of this Contract is deemed inconsistent with applicable

law, applicable law shall control.

§ 13.8 Contractor shall promptly pay to Owner all costs and reasonable attorneys fees incurred in connection with any action or proceeding in which Owner prevails, based on a breach of the Contract or other dispute arising out of or in connection with the Contract.

§ 13.9 In the event of the appointment of a trustee and/or receiver or any similar occurrence affecting the management of the account of the Contractor pertaining to the Work, it shall be the obligation of the Contractor, its representatives, receivers, sureties, or successors in interest to continue the progress of the Work without delay and specifically to make timely payment to Subcontractors and Suppliers of all amounts that are lawfully due them and to provide the Owner and all Subcontractors and Suppliers whose work may be affected with timely notice of the status of receivership, bankruptcy, etc., and the status of their individual accounts.

#### § 15.1.3 Notice of Claims

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

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

#### § 15.1.4 Continuing Contract Performance

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

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

#### § 15.1.5 Claims for Additional Cost

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

#### § 15.1.6 Claims for Additional Time

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

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

#### § 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the

Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

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

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

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

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

§15.2.5.1 All claims and disputes and other matters in question between the Contractor and the Owner arising out of or relating to the Contract Documents or a breach thereof with regard to the Engineer's decision, shall be decided through suit in New Jersey Superior Court, Camden County, and Contractor consents to the jurisdiction of the New Jersey Superior Court. The Contractor shall carry on all work and maintain its progress during such suit and the Owner shall continue to make payments not related to the dispute of the Contractor in accordance with Contract Documents.

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

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

## ARTICLE 16 - AFFIRMATIVE ACTION REQUIREMENTS

### 16.1 POLICY STATEMENT

It has long been the policy of the University to promote equal employment opportunity by prohibiting discrimination in employment and requiring affirmative action in the performance of contracts funded by the University. This policy has been reinforced and expended by an act of the legislature. The new statute, New Jersey Public Law 1975, Chapter IR, provides that no public works contractor can be awarded nor any monies paid until the prospective contractor has agreed to contract performance, which complies with the approved affirmative action plan. The law applies to each political subdivision and agency of the State and includes procurement and service contracts as well as construction contracts. This section was prepared to explain the affirmative action requirements and procedures for public agencies awarding contracts and for contractors bidding on contracts. To assure effective implementation of the affirmative action law while allowing the business operations of a government to proceed efficiently, these regulations are designed to minimize administrative paperwork and delays.



## 16.2 MANDATORY LANGUAGE

During the performance of this contract, the contractor agrees as follows:

- a) Where applicable, the contractor or sub-contractor will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, sex, affectional or sexual orientation. The contractor will take affirmative action to insure that such applicants are recruited and employed and that employees are treated during employment without regard to their age, race, creed, color, national origin, ancestry, marital status, sex, affectional or sexual orientation. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, transfer, recruitment or recruitment advertising, lay-off or termination, rates of pay or other forms of compensation and the selection for training, including apprenticeship. The contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided by the public agency compliance officer setting forth provisions of this non-discrimination clause.
- b) Where applicable, the contractor or sub-contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, sex, affectional or sexual orientation.
- c) Where applicable, the contractor or sub-contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding a notice to be provided by the agency contracting officer advising the labor union or worker's representative of the contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- d) Where applicable, the contractor or sub-contractor agrees to comply with any regulations promulgated by the Treasurer pursuant to P.L. 1975, c.127, as amended and supplemented from time to time.
- e) When hiring workers in each construction trade, the contractor or sub-contractor agrees to attempt in good faith to employ minority and female workers in each construction trade consistent with the applicable employment goal prescribed by N.J.A.C. 17:27-7.3 provided, however, that the affirmative action officer may, in its discretion, exempt a contractor or sub-contractor from compliance with the good faith procedures prescribed by the following provisions (a), (b) and (c) as long as the affirmative action office is satisfied that the contractor is employing workers provided by a union which provides evidence in accordance with standards prescribed by the affirmative action office that its percentage of active, "card carrying" members who are minority and female workers is equal to or greater than the applicable employment goal prescribed by N.J.A.C. 17:27-7.3 promulgated by the Treasurer pursuant to P.L. 1975, c.127, as amended and supplemented from time to time. The contractor or sub-contractor agrees that a good faith effort shall include compliance with the following procedures:
  - 1) If the contractor or sub-contractor has a referral agreement or arrangement with a union for a construction trade, the contractor or sub-contractor shall, within three (3) days of the contract award, seek assurances from the union that it will cooperate with the contractor or sub-contractor as it fulfills its affirmative action obligations under this contract and in accordance with the rules promulgated by the Treasurer pursuant to P.L. 1975, c.127, as it is amended and supplemented from time to time. If the contractor or sub-contractor is unable to obtain said assurances from the construction trade union at least five (5) days prior to the commencement of construction work, the contractor or sub-contractor agrees to directly attempt to hire minority and female workers consistent with the applicable employment goal. If the contractor's or sub-contractor's prior experience with a construction trade union, regardless of whether the union has provided said assurances, indicates a significant possibility that the trade union will not refer sufficient minority and female workers consistent with the applicable employment goal, the contractor or sub-contractor agrees to be prepared to hire minority and female workers directly consistent with the applicable employment goal by complying with the hiring procedures prescribed under (2) below and the contractor or sub-contractor further agrees to take immediate said action if it determines or is so notified by the affirmative action office that the union is not referring minority and female workers consistent with the applicable employment goal.
  - 2) If the hiring of a workforce consistent with the employment goal has not or cannot be achieved for each construction trade by adhering to the procedures of (1) above or if the contractor or sub-contractor does not have a referral agreement or arrangement with a union for a construction trade, the contractor or sub-contractor agrees to take the following actions consistent with the applicable county employment goals.



- (a) to notify the public agency compliance officer, affirmative action office and at least one (1) approved minority referral organization of its manpower needs and request the referral of minority and female workers;
- (b) to notify any minority and female workers who have been listed with it as awaiting available vacancies;
- (c) prior to commencement of work to request the local construction trade union, if the contractor or sub-contractor has a referral agreement or arrangement with a union for the construction trade, to refer minority and female workers to fill job openings;
- (d) to leave standing requests for additional referral to minority and female workers with the local construction trade union if the contractor or sub-contractor has a referral agreement or arrangement with a union for the construction trade, the State training and employment service and the other approved referral sources in the area until such time as the workforce is consistent with the employment goal;
- (e) if it is necessary to lay-off some of the workers in a given trade on the construction site to assure, consistent with the applicable State and Federal statutes and court decisions, that sufficient minority and female employees remain on the site consistent with the employment goal and to employ any minority and female workers laid-off by the contractor or on any other construction site in the area on which its workforce composition is not consistent with an employment goal established pursuant to rules implementing P.L. 1975, c.127;
- (f) to adhere to the following procedure when minority and female workers apply or are referred to the contractor or sub-contractor:
  - (i) If said individuals have never previously received any document or certification signifying a level of qualification lower than that required, the contractor or sub-contractor shall determine the qualifications of such individuals and, if the contractor's or sub-contractor's workforce in each construction trade is not consistent with the applicable employment goal, it shall employ such persons which satisfy appropriate qualification standards provided, however, that a contractor or sub-contractor shall determine that the individual at least possess the skills and experience recognized by any workers' skill and experience classification determination which may have been made by a public agency compliance officer, union, apprentice program or referral agency provided the referral agency is acceptable to the affirmative action office and provided further that, if necessary, the contractor or sub-contractor shall hire minority and female workers who qualify as trainees pursuant to these regulations. All of the requirements of this paragraph, however, are limited by the provisions of paragraph (3) below.
  - (ii) If the contractor's or sub-contractor's workforce is consistent with the applicable employment goal, the name of said minority or female group individual shall be maintained on a waiting list for the first consideration in the event the contractor's or sub-contractor's workforce is no longer consistent with the applicable employment goal.
  - (iii) If, for any reason, said contractor or sub-contractor determines that a minority individual or a female is not qualified or if the individual qualifies as an advanced trainee or apprentice, the contractor or sub-contractor shall inform the individual in writing with the reasons for the determination and maintain a copy in its files and send a copy to the public agency compliance officer and to the affirmative action office.
- (g) to keep a complete and accurate record of all requests made for the referral of workers in any trade covered by the contract on forms made available by the affirmative action office and shall be submitted promptly to that office upon request.

- 3) The contractor or sub-contractor agrees that nothing contained in (2) preceding provision shall preclude the contractor or sub-contractor from complying with the hiring hall or apprenticeship provisions in any applicable bargaining agreement or hiring hall arrangement and, where required by custom or agreement, it shall send journeymen and trainees to the union for referral or to the apprenticeship program for admission pursuant to such agreement or arrangement provided, however, that where the practices of a union or apprenticeship program will result in the exclusion of minorities and females or the failure to refer minorities and females consistent with the county employment goal, the contractor or sub-contractor shall

consider for employment persons referred pursuant to said provisions (2) without regarding to such agreement or arrangement; provided further, however, that the contractor or sub-contractor shall not be required to employ minority and female advanced trainees and trainees in numbers which result in the employment of advanced trainees and trainees as a percentage of the total workforce for the construction trade which percentage significantly exceeds the apprentice to journey worker ratio specified in the applicable collective bargaining agreement or, in the absence of a collective bargaining agreement, exceeds the ratio established by practice in the area for said construction trade. Also, the contractor or sub-contractor agrees that in implementing the procedures of the preceding provisions (2) it shall, where applicable, employ minority and female workers residing within the geographical jurisdiction of the union.

4) The contractor agrees to complete an initial manning report on forms provided by the affirmative action office on in the form prescribed by the affirmative action office and submit a copy of said form no later than three (3) days after signing a construction contract provided, however, that the public agency may extend in a particular case the allowable time for submitting the form to no more than fourteen (14) days and to submit a copy of the monthly project manning report once a month by the seventh (7th) work day of each month thereafter for the duration of this contract to the affirmative action office and to the public agency compliance officer. The contractor agrees to cooperate with the public agency in the payment of budgeted funds as is necessary for on-the-job and off-the-job programs for outreach and training of minority and female trainees employed on the construction site.

5) The contractor and its sub-contractors shall furnish such reports or other documents to the affirmative action office as may be requested by the office from time to time in order to carry out the purposes of these regulations and public agencies shall furnish such information as may be requested by the affirmative action office for conducting a compliance investigation pursuant to Sub-Chapter 10 of the Administrative Code, N.J.A.C. 17:27.



## PLANNING AND CONSTRUCTION

## ALLOWANCE AUTHORIZATION

Project: \_\_\_\_\_ Allowance Authorization Number: \_\_\_\_\_  
\_\_\_\_\_  
Date: \_\_\_\_\_  
Vendor: \_\_\_\_\_ RU Project Number: \_\_\_\_\_  
\_\_\_\_\_  
PO Number: \_\_\_\_\_

You are authorized to perform the following item(s) of work and to adjust the Allowance Sum accordingly:

This authorization is due to:

☐ Owners Request ☐ Field Condition Requirement ☐ Unforeseen Condition ☐ Design Error/Omission ☐ DCA Request

Explain:

**THIS IS NOT A CHANGE ORDER AND DOES NOT INCREASE OR DECREASE THE CONTRACT AMOUNT**

Original Allowance ..... \$  
Allowance Expenditures prior to this Authorization..... \$  
Allowance Balance prior to this Authorization..... \$  
Allowance will be [increased] [decreased] by this Authorization..... \$  
New Allowance Balance..... \$

### APPROVAL RECOMMENDED

\_\_\_\_\_  
Rowan Project Manager Date

\_\_\_\_\_  
VP Administration and Finance Date  
(amounts >\$30,099.99)

\_\_\_\_\_  
AVP Facilities Date  
(amounts > \$6,019.99)

☐ Attachments

Copies: ☐ Owner ☐ Contractor ☐ Consultants ☐ \_\_\_\_\_ ☐ \_\_\_\_\_ ☐ \_\_\_\_\_ ☐ File



## PLANNING AND CONSTRUCTION

## ALLOWANCE CHARGE REQUEST (PROPOSAL)

Project: \_\_\_\_\_

Allowance Charge Request Number: \_\_\_\_\_

\_\_\_\_\_

From (Contractor): \_\_\_\_\_

To: \_\_\_\_\_

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

\_\_\_\_\_

RU Project Number: \_\_\_\_\_

Re: \_\_\_\_\_

PO Number: \_\_\_\_\_

This Allowance Charge Request contains charges to be made against the contract allowance

Description of Proposed Charge:

Attached supporting information from: ☐ Subcontractor ☐ Supplier ☐ \_\_\_\_\_ ☐

Reason for Charge:

Attached pages: ☐ Proposal Worksheet Summary:  
☐ Proposal Worksheet Details:

Signed by: \_\_\_\_\_

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

Copies: ☐ Owner ☐ Contractor ☐ Consultants ☐ \_\_\_\_\_ ☐ \_\_\_\_\_ ☐ \_\_\_\_\_ ☐ File



# CHANGE ORDER REQUEST

OWNER	<input type="checkbox"/>
ARCHITECT	<input type="checkbox"/>
CONTRACTOR	<input type="checkbox"/>
FIELD	<input type="checkbox"/>
OTHER	<input type="checkbox"/>

---

PROJECT: (name, address)

CHANGE ORDER REQUEST NUMBER:

DATE OF ISSUANCE:

ARCHITECT'S PROJECT NO:

CONTRACT FOR:

OWNER: (name, address)

CONTRACT DATE:

ARCHITECT: (name, address)

FROM CONTRACTOR: (name, address)

---

The contractor must submit this proposal with all appropriate documentation and/or notify the Architect or Owner, in writing, of the date on which proposal submission is anticipated.

**THIS IS NOT A CHANGE ORDER, A CONSTRUCTION DIRECTIVE OR A DIRECTION TO PROCEED WITH THE WORK DESCRIBED IN THE PROPOSED MODIFICATIONS.**

DESCRIPTION: (Insert a written description of the Work)

ATTACHMENTS: (List attached documents that support description)

---

REQUESTED BY THE CONTRACTOR:

---

*(Signature)*

---

*(Printed Name and title)*

# CHANGE ORDER

OWNER ☐  
ARCHITECT ☐  
CONTRACTOR ☐  
FIELD ☐  
OTHER ☐

PROJECT:  
(name, address)

CHANGE ORDER NUMBER:

DATE:

TO CONTRACTOR:  
(name, address)

ARCHITECT'S PROJECT NO:

CONTRACT DATE:

CONTRACT FOR:

PURCHASE ORDER NO:

The Contract is changed as follows:

---

**Not valid until signed by the Owner, Architect and Contractor.**

---

The original (Contract Sum) (Guaranteed Maximum Price) was  
New change by previously authorized Change Orders  
The (Contract Sum) (Guaranteed Maximum Price) prior to this Change Order was  
The (Contract Sum) (Guaranteed Maximum Price) will be (increased) (decreased)  
(unchanged) by this Change Order in the amount of  
The new (Contract Sum) (Guaranteed Maximum Price) including this Change Order will be

The Contract Time will be (increased) (decreased) (unchanged) by ( ) days.  
The date of Substantial Completion as of the date of this Change Order therefore is

NOTE: This summary does not reflect changes in the Contract Sum, Contract Time or Guaranteed Maximum Price which have been authorized by Construction Change Directive.

_____ ARCHITECT	_____ CONTRACTOR	_____ Rowan University OWNER
_____ Address	_____ Address	_____ 201 Mullica Hill Road Address
_____ BY _____	_____ BY _____	_____ Glassboro, NJ 08028-1701 BY _____
_____ DATE _____	_____ DATE _____	_____ DATE _____

---

**PROJECT NAME**
**PROJECT NO.**
**CONTRACTOR**
**CONTRACT NO.**
**SUBCONTRACTOR**
**DATE**

## HOURLY LABOR RATE BREAKDOWN FORM

All Contractors (Including sub-subcontractors) need to include a detailed breakdown of all wage rates, payroll burden costs and material costs for lump sum and time and material extras. Payroll burden items, FICA, FUI, SUI, and Workmen's Compensation will be reimbursed on an average annualized basis. This information must be provided for all trade to be utilized on the project by any and all contractors at the time of contractors bid submission. The required format is as follows:  
(Reference 'Change Orders' in AIA 201 General Conditions. Certified payrolls required for all workers on Project.)

**TRADE:**
**CLASSIFICATION:**

Item			Rate Per \$100	Prevailing Wage Rate			Notes
				Regular Time	Overtime	Double Time	
Base Labor Rate							Use certified payroll to verify.
	Benefit Paid	Benefit Provided					
Fringe Benefits: (put X in appropriate box)							
Pension <sup>1</sup>							
Annuity Fund <sup>1</sup>							
Health/Welfare <sup>1</sup>							
Training/Certification <sup>1</sup>							
Vacation <sup>1</sup>							
Paid Holiday <sup>1</sup>							
Associate Dues <sup>1</sup>							
Other <sup>1</sup>							
Fringe Benefits Subtotal							
Total PW Hourly Rate							= Base Labor Rate + Benefits
Benefits Paid							
Total Paid Hourly Rate							= Base Labor Rate + Benefits
Burden: Taxes & Insurance <sup>2</sup>							
FICA							
Medicare							
Federal Unemployment							
State Unemployment							Maximum - 0.062.
Workers Compensation <sup>1</sup>							Usually less than 11%; can
Other <sup>1</sup>							
Other <sup>1</sup>							
Burden Subtotal							
Contractor Liability Insurance				N/A	N/A	N/A	Included in OH&P
Small Tools				N/A	N/A	N/A	Included in OH&P
Other (warranty, record drawings, payment bonds, performance bonds, etc.)				N/A	N/A	N/A	Included in OH&P
<b>TOTAL HOURLY RATE (Total Hourly Rate + Burden)</b>							= Amount Contractor paid to employee

Note: For change order work, mark-ups for overhead and profit shall be applied to the above rates (these rates are subject to audit) in accordance with the provisions of AIA 201 General Conditions, under 'Change Orders'.

<sup>1</sup> Costs for Overtime and Double Time are same as for Regular Time.

<sup>2</sup> Taxes & Insurance apply to Total Paid Hourly Rate which includes Base Labor Rate plus benefits paid in cash.

By signing below, the submitter certifies and declares under penalty of perjury under the laws of the State of New Jersey that the foregoing is true and correct.

Rates certified by:

(print name)

Company Name:

Signature:

Date:



**PROJECT NAME**
**Superiority Hall Renovation Project**
**CONTRACTOR**
**Cut No Corners Contractors**
**SUBCONTRACTOR**
**Don Write Electrical**
**PROJECT NO.**
**RU00000**
**CONTRACT NO.**
**PO000000**
**DATE**
**1/1/2019**

## HOURLY LABOR RATE BREAKDOWN FORM

All Contractors (Including sub-subcontractors) need to include a detailed breakdown of all wage rates, payroll burden costs and material costs for lump sum and time and material extras. Payroll burden items, FICA, FUI, SUI, and Workmen's Compensation will be reimbursed on an average annualized basis. This information must be provided for all trade to be utilized on the project by any and all contractors at the time of contractors bid submission. The required format is as follows:  
(Reference 'Change Orders' in AIA 201 General Conditions. Certified payrolls required for all workers on Project.)

**TRADE:**
**Electrical**
**CLASSIFICATION:**
**Electrical Forman**

Item	Rate Per \$100		Prevailing Wage Rate			Notes
			Regular Time	Overtime	Double Time	
Base Labor Rate			\$ 37.40	\$ 56.10	\$ 74.80	Use certified payroll to verify.
	Benefit Paid	Benefit Provided				
Fringe Benefits:	(put X in appropriate box)					
Pension <sup>1</sup>		X	5.65	5.65	5.65	
Annuity Fund <sup>1</sup>		X	-	-	-	
Health/Welfare <sup>1</sup>	X		10.40	10.40	10.40	
Training/Certification <sup>1</sup>	X		0.70	0.70	0.70	
Vacation <sup>1</sup>		X	-	-	-	
Paid Holiday <sup>1</sup>		X	-	-	-	
Associate Dues <sup>1</sup>		X	-	-	-	
Other <sup>1</sup>		X	0.41	0.41	0.41	
Fringe Benefits Subtotal			\$ 17.16	\$ 17.16	\$ 17.16	
Total PW Hourly Rate			\$ 54.56	\$ 73.26	\$ 91.96	= Base Labor Rate + Benefits
Benefits Paid			\$ 11.10	\$ 11.10	\$ 11.10	
Total Paid Hourly Rate			\$ 48.50	\$ 67.20	\$ 85.90	= Base Labor Rate + Benefits
Burden: Taxes & Insurance <sup>2</sup>						
FICA	0.0620		3.01	4.17	5.33	
Medicare	0.0145		0.70	0.97	1.25	
Federal Unemployment	0.0080		0.39	0.54	0.69	
State Unemployment			-	-	-	Maximum - 0.062.
Workers Compensation <sup>1</sup>			-	-	-	Usually less than 11%; can
Other <sup>1</sup>			-	-	-	
Other <sup>1</sup>			-	-	-	
Burden Subtotal			\$ 4.10	\$ 5.68	\$ 7.26	
Contractor Liability Insurance			N/A	N/A	N/A	Included in OH&P
Small Tools			N/A	N/A	N/A	Included in OH&P
Other (warranty, record drawings, payment bonds, performance bonds, etc.)			N/A	N/A	N/A	Included in OH&P
<b>TOTAL HOURLY RATE (Total Hourly Rate + Burden)</b>			<b>\$ 58.66</b>	<b>\$ 78.94</b>	<b>\$ 99.22</b>	= Amount Contractor paid to employee

Note: For change order work, mark-ups for overhead and profit shall be applied to the above rates (these rates are subject to audit) in accordance with the provisions of AIA 201 General Conditions, under 'Change Orders'.

<sup>1</sup> Costs for Overtime and Double Time are same as for Regular Time.

<sup>2</sup> Taxes & Insurance apply to Total Paid Hourly Rate which includes Base Labor Rate plus benefits paid in cash.

By signing below, the submitter certifies and declares under penalty of perjury under the laws of the State of New Jersey that the foregoing is true and correct.

**Rates certified by:**
**Don Write**

(print name)

**Company Name:**
**Don Write Electrical**
**Signature:**
*Don Write*
**Date:**
*1/1/2019*

## Project #

\_\_\_\_\_

**VISITORS:**[illegible]





# APPLICATION AND CERTIFICATE FOR PAYMENT

AIA DOCUMENT G702

TO OWNER:

PROJECT:

APPLICATION NO:

PERIOD TO:

PROJECT/CONTRACT NO:

FROM CONTRACTOR:

VIA ENGINEER:

CONTRACT DATE:

APPLICATION DATE:

## CONTRACTOR'S APPLICATION FOR PAYMENT

### CHANGE ORDER SUMMARY

Change Orders approved in previous months by owner		ADDITIONS	DEDUCTIONS
TOTAL			
Approved This Month Number	Date Approved		
TOTALS			
Net Change By Change Orders			

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By:

Date:

Application is made for Payment, as shown below, in connection with the Contract.

Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM.....
2. Net change by Change Orders.....
3. CONTRACT SUM TO DATE (LINE 1 + 2).....
4. TOTAL COMPLETED & STORED TO DATE.....  
{Column G on G703}
5. Retainage:
  - a. % of Completed Work.....  
{Column D + E on G703}
  - b. 0 % of Stored Materials.....  
{Column f on G703}Total Retainage (line 5a + 5b or  
Total in Column I of G703).....
6. TOTAL EARNED LESS RETAINAGE.....  
{Line 4 less Line 5 Total}
7. LESS PREVIOUS CERTIFICATES FOR  
PAYMENT (Line 6 from prior Certificate).....
8. CURRENT PAYMENT DUE.....
9. BALANCE TO FINISH, PLUS RETAINAGE.....  
{Line 3 less Line 6}

State

County of:

Subscribed and sworn to before me this day of

2010

Notary Public:

My Commission expires:

AMOUNT CERTIFIED.....

\$

{Attach explanation if amount certified differs from the amount applied for.}

ARCHITECT:

By: Date:

This Certificate is not negotiable. THE AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

## ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, Based on on-site observations and the data comprising the above application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AIA Document G702, APPLICATION AND CERTIFICATE FOR PAYMENT, containing Contractor's signed Certification is attached.  
In tabulations below, amounts are stated to the nearest dollar  
Use Column I on Contracts where variable retainage for line items may apply.

PROJECT NO:

[illegible]

Attachment to G702 (or equivalent)  
Certification for Payment

Project Name: \_\_\_\_\_

Project Number: \_\_\_\_\_ Payment Number: \_\_\_\_\_

I, \_\_\_\_\_, a prime contractor working for Rowan University on the above-mentioned project, hereby certify as required by P.L. 191, c.507 of the State of New Jersey that: **(you must check one under "A" and one under "B")**

A. With respect to previous progress payments:

- ( ) all my sub-contractors and suppliers have been paid all amounts due from all previous progress payments I have received from Rowan University for my work on this project
- ( ) all my sub-contractors and suppliers have been paid all amounts due from all previous progress payments with the exception of those listed below for which payment is being withheld as there exists a valid basis for those sub-contractors and suppliers listed below under the terms of their contract(s) to withhold payment from each such sub-contractor and supplier:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

For each such sub-contractor and supplier for which payment is being withheld, I further certify that written notice detailing the specific reason(s) for withholding payment has been provided to each such sub-contractor and supplier with copies

thereof provided to my performance bond company and Rowan University.

B. With respect to this payment number\_\_\_\_\_:

- ( ) all my sub-contractors and suppliers shall be paid all amounts due from this progress payment
- ( ) all my sub-contractors and suppliers shall be paid all amounts due from this progress payment with the exception of those listed below for which payment will be withheld as there exists a valid basis for those sub-contractors and suppliers listed below under the terms of their contract(s) to withhold payment from each such sub-contractor and supplier:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

For each sub-contractor and supplier for which payment is being withheld, I further certify that written notice detailing the specific reason(s) for withholding payment has been provided to each sub-contractor and supplier with copies thereof provided to my performance bond company and Rowan University.

I certify that the above statements are true. I am aware that if any of the above statements are willfully false, I am subject to punishment.

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

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Please Print Name

**CONTRACTOR'S PARTIAL OR FINAL RELEASE AND WAIVER OF LIENS**

**OWNER:**

**CONTRACT FOR:**

**OWNER'S AGENT:**

**PROJECT:**

**CONTRACT DATE:**

Upon receipt by the undersigned Contractor of a check from Owner in the sum of \$\_\_\_\_\_, which check will consume payment of all sums due the Contractor for labor, equipment and/or materials supplied in connection with the Project, and when said check has been paid by the bank upon which it is drawn, this document shall become effective to fully and finally waive and release any and all liens, claims, liabilities, actions, and demands that this Contractor and all its subcontractors have or might have against Owner, Lender, the Project, the real property upon which the Project is located and any and all other property owned by Owner on account of or in connection with labor, equipment and/or materials supplied by the undersigned to the Project.

The undersigned Contractor does hereby further acknowledge and represent that through the date hereof the undersigned has received payments totaling \$\_\_\_\_\_ for labor, equipment and/or materials supplied to the Project.

This instrument has been executed as of the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

**CONTRACTOR:**

\_\_\_\_\_

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

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

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

STATE OF \_\_\_\_\_ δ

δ

COUNTY OF \_\_\_\_\_ δ

Sworn to and subscribed before me the undersigned authority on this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

[ S E A L ]

My Commission Expires:

\_\_\_\_\_

\_\_\_\_\_  
Notary Public, State of \_\_\_\_\_

\_\_\_\_\_  
Printed Name of Notary Public



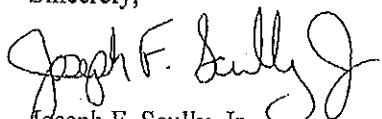
To Whom It May Concern:

Your recent request to Rowan University requesting information or a tax exempt form is hereby acknowledged.

It has been determined that Rowan University is a government body and is Exempt from New Jersey Sales and Use Taxes imposed by the Sales and Use Tax Act (P.L. 1966, c.30 and c.52). An opinion from the State of New Jersey, Office of the Attorney General has been reproduced below.

If you have any questions, please contact the Accounts Payable Office at (856) 256-4115.

Sincerely,

  
Joseph F. Scully, Jr.  
Vice President for Finance & CFO



CHRIS CHRISTIE  
Governor

KIM GUADAGNINO  
Lt. Governor

State of New Jersey  
OFFICE OF THE ATTORNEY GENERAL  
DEPARTMENT OF LAW AND PUBLIC SAFETY  
DIVISION OF LAW  
25 MARKET STREET  
PO Box 112  
TRENTON, NJ 08625-0112

PAULA T. DOW  
Attorney General

ROBERT M. HANNA  
Director

May 4, 2011

Joseph F. Scully, Jr.  
Vice President for Finance & CFO  
Rowan University  
Bole Hall  
201 Mullica Hill Road  
Glassboro, NJ 08028-1701

Re: Tax Exempt Status of Rowan University  
Federal Tax ID #222-764-819

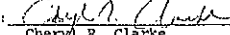
Dear Mr. Scully:

You have asked this office for an opinion whether Rowan University is obligated to pay New Jersey sales and use taxes in the conduct of the University's business.

You are hereby advised that, pursuant to N.J.S.A. 54:32B-9, any sales, service or amusement charge by or to the University or any use or occupancy by the University is not subject to taxes imposed by the New Jersey Sales and Use Tax Act, N.J.S.A. 54:32B-1 et seq., where the University or its authorized representative conducting University business, is the purchaser, user or consumer. Further, should the United States or any other state grant an exemption from certain taxes to the State of New Jersey, Rowan University, as an arm of the State, is entitled to such consideration.

Sincerely yours,

PAULA T. DOW  
ATTORNEY GENERAL OF NEW JERSEY

By:   
Cheryl R. Clarke  
Deputy Attorney General

CRC/zd



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Chief Financial Officer  
Bole Hall  
201 Mullica Hill Road  
Glassboro, NJ 08028-1701

856-256-4127  
856-256-4443 fax



**CONSENT OF  
SURETY COMPANY  
TO FINAL PAYMENT**

AIA DOCUMENT G707

OWNER  
ARCHITECT  
CONTRACTOR  
SURETY  
OTHER

☐  
☐  
☐  
☐  
☐

PROJECT:  
(name, address)

TO (Owner)

☐

☐ ARCHITECT'S PROJECT NO.:  
CONTRACT FOR:

☐

☐ CONTRACT DATE:

CONTRACTOR:

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the  
(there insert name and address of Surety Company)

, SURETY COMPANY,

on bond of (there insert name and address of Contractor)

, CONTRACTOR,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not  
relieve the Surety Company of any of its obligations to (there insert name and address of Owner)

, OWNER,

as set forth in the said Surety Company's bond.

IN WITNESS WHEREOF,  
the Surety Company has hereunto set its hand this

day of

2017

Surety Company

Signature of Authorized Representative

Attest:  
(Seal):

Title

NOTE: This form is to be used as a companion document to AIA DOCUMENT G706, CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND  
CLAIMS, Current Edition

## SECTION 011000 - SUMMARY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section. In the event of any conflicts between the requirements of these Sections, the more stringent requirement shall apply.

#### 1.2 SUMMARY

1. This Section includes the following:
  1. Work covered by the Contract Documents
  2. Contract
  3. Specification formats and conventions
  4. Use of premises.
2. Related Sections include the following:
  1. Division 01 Section "Construction Facilities and Temporary Controls" for limitations and procedures governing temporary use of Owner's premises.

#### 1.3 WORK COVERED BY CONTRACT DOCUMENTS

1. Project Identification:
  1. Project Location: Rowan University, Glassboro, New Jersey
    - a. Cooper Medical School of Rowan University (CMSRU)  
401 South Broadway  
Camden, NJ
  2. Owner: Rowan University
2. Architect Identification: The Contract Documents were prepared for Project by:
  1. NK Architects  
107-109 S. 13<sup>th</sup> Street, Suite B  
Philadelphia, PA 19107
3. The Work consists of the following:
  1. The scope of work shall not be limited to what is specifically called out on the drawings and/or specifications, but shall include any and all demolition, temporary work, protection of stockpiled materials for re-use, dewatering, cutting and patching, temporary protection and shoring, and all work as required to accomplish the intended construction.
  2. The contractor will be permitted to conduct their building surveys once the letter of award is issued. Contractor shall also begin the submittal process.
  3. Contractor must outline in their bid any long lead items that may impact their ability to meet the deadlines of the schedule. Failure to advise of long lead items shall

- preclude Contractor from right to additional time and/or costs associated with such delay.
4. Rowan University has submitted the Plans and Specification to The Department of Community Affairs (DCA) for the Plan Review Process.
  5. Contractor is responsible for submitting and securing all necessary permits to complete the work.
  6. Bid shall include all work shown on the Contract Drawings, Technical Specifications, and other documents issued under this IFB.
  7. Contractor must follow all OSHA and Rowan safety guidelines and procedures.
  8. Contractor shall Schedule and Coordinate all work activities with Rowan University.
  9. Contractor must bid the project to meet the schedule outlined in the bid documents which may include weekend and/or shift work. Contractor must staff the project accordingly to meet the schedule since the end date is firm. Rowan will not entertain change orders for contractor's inability to meet this schedule or time extensions.
  10. Contractor is responsible to schedule and manage all required inspections, including but not limited to Final Certificate of Occupancy inspection.
  11. Contractor is required to maintain a clean job site and to turn over the building back to the owner in the condition it was received.
  12. Contractor is responsible to perform final cleaning prior to Final Turn Over and Owner's Final Acceptance.

## 1.5 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 48-division format and CSI/CSC's "MasterFormat" numbering system.
  1. 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. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.

## 1.4 USE OF PREMISES

1. General Construction Operations: Contractor shall have limited use of premises for construction operations, including a limited use of the project site (outside the facilities exterior walls) during the period of construction activity. Contractor's use of the premises is limited by Rowan's right to perform work or to retain other contractor's on portions of the Project or to limit access for events or other functions as the University might require. The Contractor will be given notice of any such events well in advance so that arrangements can be made to insure the prosecution of the work continues as scheduled.
2. Arrange use of site and premises to allow:
  1. Owner occupancy.
  2. Work by others.
  3. Work by Owner.
3. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond the building perimeter unless prior approval of the University is received prior to conducting such work or operations.
  1. Limit site disturbance, as approved by Rowan University.
  2. **REFER TO SECTION 011400 FOR WORK HOURS.**

3. Storage of construction materials and equipment is not permitted inside the existing building.
4. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Rowan University, Rowans 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 the driveways and entrances.
  - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
4. 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.
5. **The Contractor will be responsible for photographing the entire area of work, adjacent spaces where incidental work may occur, corridors and elevators accessing the area of work, the loading area, and contractor parking area. The Contractor will provide Owner with digital copies of all the photographs prior to mobilization as a record of the existing conditions PRIOR to the start of the works. Digital format shall be in PDF format.**

#### 1.5 SPECIFICATION FORMATS AND CONVENTIONS

1. Specification Format: The Specifications are organized into Divisions and Sections using the 48-division format and CSI/CSC's "MasterFormat" numbering system.
  1. 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. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.

#### 1.6 MISCELLANEOUS PROVISIONS

**A. WORK REQUIRED TO BE PERFORMED UNDER THIS CONTRACT SHALL BE COMPLETED IN ACCORDANCE WITH THE FOLLOWING MILESTONES AND COMPLETION DATES. CONTRACTORS MUST INCLUDE IN THEIR BIDS ALL COSTS INCLUDING OVERTIME ASSOCIATED WITH INSURING THAT THE PROJECT IS COMPLETED BY THE MILESTONE DEADLINES LISTED HEREIN.**

**B. Summary of Milestones:**

1. The Notice to Proceed (NTP) is anticipated by May 2, 2025, with a contract duration of 200 calendar days to achieve Substantial Completion by 11/18/2025.
2. All Submittals and Shop Drawings must be submitted to the Architect within 60 days of issuance of the Notice to Proceed.
3. Final Completion will be achieved within 60 calendar days from the issuance of Substantial Completion which will include All construction punch list work, closeout documentation, final payment application, etc.

**C. Weather Conditions:**

1. Unfavorable weather conditions shall not be justification for delays in completion or final completion dates as specified. No change orders will be issued or approved for extensions of time due to weather conditions. Seasonal weather conditions shall be considered in the planning and scheduling of all work influenced by high or low ambient temperatures for the completion of all contract work within the allotted contract time. In addition, appropriate allowances shall be made for anticipated time losses due to normal rain and snow conditions by statistically expanding the estimated time durations for weather sensitive activities with the constraint that the substantial completion deadline cannot change.
  2. The University may at its sole discretion entertain extensions of time from the contractor for weather related delays. However no extensions of time shall be considered by the University until at least twenty-five (25) lost project schedule days have accrued. Lost time will accrue on a proportionate basis – 1/4 lost day will be charged as 1/4 lost day, 1/2 lost day will be charged as 1/2 lost day, and so forth. A lost project schedule day is considered a day or any portion of a day when all members of the construction workforce on the project cannot work due to inclement weather conditions. Whether or not the contractors' workforce fails to begin work or leaves the project site on any given day due to a claim of inclement weather a lost project schedule day will not be recognized by the University until it is approved in writing by the Owner's Project Manager.
  3. Should the University approve an extension of time the contractor may only submit reimbursement for the cost of the extension of rental equipment agreements; bond premium and insurance adjustments at actual cost with no mark up; and general conditions directly impacted by the approved extension. Appropriate back up documentation as requested by the Owner's Project Manager must accompany any submission for reimbursement. Appropriate back up can be anything from copies of contractor's rental agreements showing rental durations, unit costs, rental rates, etc. to copies of superintendents pay stubs.
- D. Intent of Contract: The drawings and specifications of the contract are intended to require the contractor to provide for everything reasonably necessary to accomplish the proper and complete finishing of the work. All work and materials included in the specifications and not shown on the drawings, or shown on the drawings and not in the specifications, shall be performed and/or furnished by the contractor as if described in both. Any incidental materials and/or work not specified in the drawings and/or the specifications which are, nevertheless, necessary for the true development thereof and reasonably inferable therefrom, the contractor shall understand the same to be implied and required, and shall perform all such work and furnish all such materials as if particularly delineated or described therein. Should there be an obvious error between the drawings and specifications, the most stringent constraints of the conflicting information shall be assumed by the contractor and it shall be the contractor's responsibility to complete the work as reasonably required, consistent with the intent of such drawings and specifications as may be interpreted by the University.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 011000

## SECTION 011400 – WORK RESTRICTIONS

### 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. In the event of any conflicts between the requirements of these Sections, the more stringent requirement shall apply.

#### 1.2 USE OF PREMISES

- A. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the Work is indicated.
  - 1. Limits: Confine construction operations to weekdays (Monday through Friday) from 7:00 AM to 5:00 PM. Weekend and Holiday work may be permitted if approved by the Owner.
  - 2. Owner Occupancy: Allow for Owner occupancy of building, site and use by the public.
  - 3. Driveways and Entrances: Keep streets, driveways 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.
- B. Use of Existing Building: Repair damage caused by construction operations. Protect building and its occupants during construction period.

#### 1.3 OCCUPANCY REQUIREMENTS

- A. Full Owner Occupancy: Owner will occupy site and existing building during entire construction period. 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.

#### 1.4 WORK SEQUENCE

- A. Work shall be completed within the schedule as outlined in Section 011000 – Summary. University intends to issue Notice to Proceed, Construction Contract, and/or University Purchase Order as evidence of contract award on or before Project start date listed.

#### 1.5 CONTRACTOR WORK AREAS, WORKING CONDITIONS AND EQUIPMENT STORAGE REGULATIONS

- A. The Contractor shall not unreasonably encumber the facilities with its equipment or work to be performed. Work conducted by the Contractor, Subcontractor, or any other person and/or firm affiliated with the Contractor shall be contained within pre-designated working areas established by the documents.

- B. The Contractor shall, at all times during the progress of the work, keep the site free from the accumulation of all rubbish and debris caused by its performance. The Contractor shall remove all debris and rubbish related to its work at the end of each workday to the satisfaction of the Owner's Project Manager. Tool storage boxes shall not be permitted inside the building on the first floor or outside the building.
- C. The Contractor shall adequately secure and protect its equipment, materials and vehicles. The University assumes no liability for any damage to, or theft of, the Contractor's property. The Contractor shall have the use of a designated area for storage and staging of construction materials and equipment. The Contractor shall be responsible for adhering to security procedures outlined by the Owner's Project Manager.
- D. The Contractor is responsible for all safety precautions for all of its employees and property while performing its services.
- E. The Contractor shall strictly limit its employees' use of the facilities for lunch, smoking or rest time usage to only those areas designated by the Owner's Project Manager. Use of facility telephones will not be allowed. Use of building toilet facilities shall not be permitted. Smoking is not allowed inside the building.

1.6 WORK STOPPAGES, EXISTING UTILITY INTERRUPTIONS, NOISE AND ODOR RESTRICTIONS, AND MATERIAL APPROVALS

- A. Work Stoppages – DOES NOT APPLY.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Owner not less than five (5) working days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Owner's Project Manager's written permission.
- C. Consideration shall be given by the Contractor regarding odors emanating from adhesives and sealants, etc and excessive noise. If the odors or noise are such that they may disturb the employees and guests, then such work shall be performed while the building is not occupied. This determination shall be at the sole discretion of the Owner's Project Manager. The playing of radios and other unnecessary noise will not be permitted at any time.
- D. All material safety data sheets shall be submitted and approved by the Owner's Project Manager prior to use of the material.
- E. The playing of radios and other unnecessary noise will not be permitted at any time.

1.7 PROTECTION OF INTERIOR FINISHES

- A. The Contractor shall take extra care to avoid damage or soiling to any part of the facility. The Contractor is responsible for all damages or destruction caused directly or indirectly by its performance to any part of the building or adjoining property. Any damage or destruction caused by the Contractor or its employees will be repaired or replaced as the Owner's Project Manager directs and to their satisfaction with all costs charged to the Contractor. The costs may be deducted from any and all amounts due to the Contractor.

- B. Any of the Contractor's employees found defacing, damaging or marring the building or its finishes or contents shall be immediately removed by the Contractor. The Contractor shall be charged for all remedial work to restore the damaged area or contents to their original condition to the satisfaction of the State.
- C. The Contractor shall take all necessary steps to ensure adequate protection of all building furniture, equipment and building finishes, including but not limited to: floors, walls, ceilings, windows, draperies, blinds, carpeting, doors, doorways and contents. In this endeavor, all workers are to take precautions to protect rugs and floors. The Contractor shall be charged for all remedial work to clean, repair and/or replace items damaged by the Contractor to the satisfaction of the State.
- D. The Contractor is responsible for the cost of cleanup of dust, dirt and stains caused by the work to the satisfaction of the Owner's Project Manager. The Contractor shall take all necessary precautions to keep dust, dirt and debris to a minimum both within the construction area and throughout the buildings.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 011400



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## SECTION 012100 - ALLOWANCES

### 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 governing allowances.
  - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
  - 1. Lump-sum allowances.
- C. Related Requirements:
  - 1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

#### 1.3 DEFINITIONS

- A. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

#### 1.4 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

#### 1.5 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

## 1.7 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

## 1.8 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of permit filing fees.
- B. Unused Allowance: Any funds not used for permit filing shall be returned by Change Order to the Owner.

## 1.9 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance.
- 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 Contractor's handling, labor, installation, overhead, and profit.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

### 3.2 PREPARATION

- A. 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.

### 3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Lump-Sum Allowance: Include the sum of \$75,000.00 for filing of construction permits.

END OF SECTION 012100

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## SECTION 012400 – PROCEDURES AND CONTROLS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, General Conduct of the Work and Special Requirements, Supplementary Conditions, and other Division 01 Specification Sections, apply to this Section. In the event of any conflicts between the requirements of these Sections, the more stringent requirement shall apply.

#### 1.2 DESCRIPTION OF WORK

- A. The types of minimum requirements for procedures and performance or control work of a general nature, to be fulfilled collectively by contractors, include but are not necessarily limited to the following categories:
  - 1. Coordination and meetings.
  - 2. Administration/supervisory personnel.
  - 3. Examination and checking of contract drawings.
  - 4. Surveys and records or reports.
  - 5. Limitations for use of site.
  - 6. Protection of Persons and Property.
  - 7. Special reports.
  - 8. Subcontractor, material approval.
  - 9. Tradesmen and workmanship standards.
  - 10. Inspections, tests and reports.
  - 11. Progress photographs.
  - 12. General installation provisions.
  - 13. Control Wiring.
  - 14. Chases, recesses and openings.
  - 15. Sleeves, built-in items.
  - 16. Cutting and patching.
  - 17. Uncovering and correction of work.
  - 18. Cleaning and protection.
  - 19. Conservation and salvage.

#### 1.3 COORDINATION AND MEETINGS

- A. General: Contractor shall prepare a written memorandum of general instructions on required coordination activities including notices/reports/meetings, and distribute memorandum to each engaged entity performing work at project site, with copies to Architect and Owner.
- B. Coordination Drawings: Where work by separate entities requires off-site fabrication of products and materials which must be accurately interfaced and closely intermeshed to produce required results, prepare coordination drawings to indicate how work shown by separate shop drawings will be interfaced, intermeshed, and sequenced for installation.
  - 1. Comply with submittal requirements of "Submittals" section, and other requirements outlined in the other Divisions.
- C. Biweekly Job Meeting: The Contractor's Project Manager and Superintendent, the Owner's

Project Manager and the Architect shall attend biweekly job meetings convened by the Owner for the purpose of affording the opportunity to review Contractor's coordination efforts, to expedite the performance of administrative tasks, and to generally assess the work progress. Contractor shall require representation (at each meeting) by every entity currently involved in coordination or planning for the work (of the entire project). Contractor shall participate in meetings in a manner, which will resolve coordination problems.

1. Time and location of job meetings shall be designated by the mutual agreement of the Contractor, Architect and Owner.
2. Job meetings shall be chaired by the Architect, who shall record the proceedings in the form of minutes and shall be responsible for proper distribution thereof to all parties. Initial minutes will be distributed within three (3) business days after the meeting.
3. Any and all corrections or clarifications to these minutes shall be received by the Architect in writing within three (3) days of their issuance. After the interval allowed for corrections and clarifications, Job Meeting Minutes will stand as part of the project record.
4. All decisions, instructions and interpretations given by Owner, with concurrence of the Architect, at these meetings shall be binding and conclusive on Contractor.
5. Architect and Owner shall have the right to schedule Special Job Meetings or increase the frequency of job meetings if, in his opinion, the progress and condition of the work warrant it. Attendance at such meetings is mandatory.
6. Subcontractors and suppliers shall attend at the request of the Architect or Owner as appropriate to the agenda topics at each meeting.
7. Agenda:
  - a. Review of Work progress.
  - b. Field observations, problems, and decisions.
  - c. Identification of problems, which impede planned progress.
  - d. Maintenance of Progress Schedule- updated by Contractor and discussed at every meeting.
  - e. Corrective measures to regain projected schedule milestones and deadlines.
  - f. Planned progress during succeeding work period and two (2) week look ahead.
  - g. Effect of proposed changes on progress schedule and coordination.
  - h. Review and update Submittal Log for every meeting.
  - i. Other business relating to the Work.

D. Pre-Construction Meeting: Owner will schedule a meeting after Notice of Award.

1. Attendance Required:
  - a. Owner.
  - b. Architect.
  - c. Contractor.
2. Agenda:
  - a. Execution of Owner/Contractor Agreement.
  - b. Submission of executed bonds and insurance certificates.
  - c. Distribution of Contract Documents.
  - d. Submission of list of Subcontractors, list of Products, schedule of values, etc.
  - e. Procedures and processing of field decisions, submittals, substitutions, applications for payment, proposal requests, Change Orders, and Contract closeout procedures.
  - f. Scheduling (Preliminary Progress Schedule by Contractor).

3. The above Agenda is a comprehensive list of items that could be discussed at the Pre- Construction Meeting. Some items will be included while the Owner may choose to handle other items by other means.
  4. Architect will record minutes and distribute copies within two (2) days after meeting to participants, with two copies to Contractor, Owner, and those affected by any decisions made.
- E. Pre-Installation Conferences:
1. When required by individual specification sections, contractor shall convene a pre-installation conference prior to the start of installation for the portion of work in question.
  2. Require attendance of all Subcontractors, suppliers, manufacturers (if necessary), Owner Architect (at the Owners request), Engineers (at the Owners request) directly affecting of affected by the Work in question.
- F. Application for Payment "PENCIL COPY" review meeting:
1. Contractor to schedule a Pencil Copy Review Meeting five (5) working days prior to payment period deadline stipulated in the Agreement.
  2. Contractor will be responsible to incorporate all agreed upon changes to the Pencil Copy version of the Application and submit the revised Application in accordance with all Contract requirements.

#### 1.4 ADMINISTRATIVE/SUPERVISORY PERSONNEL

- A. General: In addition to a Home Office Project Manager and a Field Construction Superintendent and other administrative and supervisory personnel required for performance of the work, the Contractor shall provide specific coordinating personnel as may be required for proper interface between the trades and other work of the total project.
- B. Project Superintendent: The Contractor shall provide a full-time Project Superintendent, who is experienced in administration and supervision of building construction of a type similar in nature and scope to this Project, including mechanical and electrical work, and who is hereby authorized to act as the general coordinator of interfaces between the work of all the trades. For purpose of this provision, "interface" is defined to include the scheduling and sequencing of work, sharing of access to work spaces, installations, each trade's protection of work by other trades, cutting and patching, tolerances, preparation of coordination drawings, inspections, tests, and temporary facilities and services.
- C. Submittal of Staff Names, Duties: Within 15 days of contract date, the Contractor shall submit to the Owner and Architect a listing of Contractor's principal staff assignments and consultants, naming persons and listing their addresses, telephone numbers and past construction experience.

#### 1.5 EXAMINATION AND CHECKING OF CONTRACT DOCUMENTS

- A. Contractor shall be responsible for reviewing the contract documents in accordance with the requirements specified herein.
1. Contractor shall examine and check all quantities and dimensions given on contract drawings, and shall be responsible for noting any errors which can be discovered by such examination and check, and shall be responsible for satisfactory joining and fitting of all parts of the work; any check or observation by Architect/Engineer shall not relieve the Contractor of any responsibility as to correctness of the work.



2. Field verification of dimensions on drawings is specifically directed and required of the Contractor as a matter of course, because locations, distances and elevations will be governed by actual field conditions. Contractor shall review plans, site plans and details of construction on the drawings, and adjust his work to conform to all conditions indicated thereon or reasonably inferable therefrom.
3. Discrepancies shown on different plans and details, or between drawings, and actual field conditions, or between drawings and specifications, shall promptly be brought to the attention of the Architect for interpretation and resolution.
4. If, in Contractor's opinion, any work is indicated on drawings or specified in such a manner as will make it impossible to produce such in conformance with the contract, he shall refer same to Architect for interpretation. If additional and supplementary instructions are necessary, Architect/Engineer will prepare and issue same in an appropriate form to the Contractor, with a copy being forwarded to the Owner.
5. Contractor is directed never to scale dimensions or locations from contract drawings. Consult Architect/Engineer for dimensions and locations of all items.

## 1.6 SURVEYS AND RECORDS/REPORTS

- A. General: Working from lines and levels established by property survey, and as shown in relation to the work, the Contractor shall establish and maintain bench marks and other dependable markers to set lines and levels for the work at each story of construction and elsewhere on site as needed to properly locate each element of entire project. Contractor shall calculate and measure required dimensions as shown (within recognized tolerances if not otherwise indicated); and shall not scale drawings to determine dimensions. Advise tradesmen performing the work, of marked lines and levels provided for their use in layout of work.

## 1.7 LIMITATIONS FOR USE OF SITE

- A. General: It is the intent of the Owner to preserve the present character of the campus to the greatest extent possible, both during and after the period of construction. To this end the Contractor will be subject to certain operational controls in the movement of personnel and equipment on and off the construction site. The Contractor's cooperation with the general goal of protecting and preserving the Institute campus, and with the specific controls specified hereinafter, shall be mandatory. The following general controls shall be observed:
  1. Construction activities, including location of temporary support facilities, stockpiling of materials, loading and unloading, parking for construction personnel and other related activities shall be restricted to areas as specified by the Owner.
  2. The accumulation or stockpiling of debris, rubbish or other material resulting from demolition or construction operations will not be permitted. Removal and off-site disposal must proceed concurrent with demolition and construction activities, to the end that the site shall at all times present a neat, orderly and workmanship appearance. No liquid or solid material of any kind is to be disposed of on campus property. No burning of trash or debris will be permitted on the site.
  3. The Contractor shall be responsible for the prevention, abatement and control of any environmental pollution arising from demolition or construction activities in the performance of the work, in full compliance with all applicable Federal and State laws and regulations.
    - a. Existing trees and other vegetation on and adjacent to the project site shall be protected. Refer to Section 015000 - "Temporary Facilities" - for specific requirements concerning fencing. Under no circumstances shall materials be stored or heavy equipment operated beneath the drip lines of existing trees.

4. Contractor shall be responsible for the control of dust arising from demolition or construction operations within the project site or along the Access Routes.
- B. Allocation of Space: In addition to site utilization limitations and requirements shown on drawings, and indicated by other contract documents, Contractor shall administer allocation of available space equitably among separate subcontractors and other entities needing access and space, so as to produce overall efficiency in performance of total work of project.
- C. Deliveries: Contractor shall schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.
- D. Construction Access:
  1. Contractor shall plan, coordinate and execute all construction activities in such manner as to avoid traffic disruption over local streets.
    - a. Prior to the start of work, Contractor shall contact the Police Department and determine approved travel routes for delivery vehicles on local streets.
    - b. Contractor shall obtain and pay for all necessary permits in connection with the operation of overweight and over length vehicles on City streets.
  2. Contractor shall be responsible for controlling all traffic entering and leaving the Owner's property including provision of flagmen as necessary. Contractor shall be responsible to require mud removal from rubber-tired vehicles departing the immediate project site. Operation of tracked vehicles shall be restricted to the project site as defined by the contract limit lines, and is not permitted on paved areas.
  3. Whenever and wherever the project work must be performed outside the contract limit lines, and after the necessary permits have been secured from local authorities, Contractor shall erect and maintain barricades, danger signals and warning signs at working sites, closed roads, intersections and other places of danger to traffic, the work, or the public. Barricades and obstructions of any kind shall be marked with lights or flares at not more than five (5) foot intervals visible for a distance of not less than 500 feet. Contractor shall provide sufficient watchmen and traffic directors and shall take all necessary precautions for the proper protection of the work and the safety of the public.
  4. Contractor shall be responsible for identification, control and maintenance of construction traffic within the contract limit lines. Identification and control shall include the provision of temporary traffic signs and the installation of barricades and warning lights to protect the work and to identify excavations or other hazards, all as may be required. Maintenance shall include the provision and placing of ballast materials as may be required, grading and compaction, removal of debris, removal of snow, and general care to insure a serviceable roadbed at all times.
    - a. The Owner shall be responsible for snow removal from paved roadways and parking lots in the vicinity of the project area, but not within the work areas or areas immediate to the Contractor's temporary facilities.
  5. Prior to final completion, perform all cleaning and repairs as necessary to restore all existing areas within the limits of any and all work required as a part of the scope of these contract documents, to their original condition.
- E. Temporary Parking for Construction Personnel: The Owner shall designate available areas for parking.
  1. Offsite parking will be available for employee parking, in an area to be designated by

the Owner on RUI property. Construction personnel will not be permitted to park in campus parking lots, except as specifically designated and authorized by the Owner. The designated parking area may change due to seasonal demands of the Owner.

- F. Staging and Storage Area: The Contractor shall have the authority and responsibility to plan and locate storage areas, equipment marshaling areas, and temporary field facilities. Staging and storage areas shall be so located and utilized as to afford unrestricted access to all of the work at all times. Such areas shall not encroach upon access routes to the work, nor shall they be so located or utilized as to impede free access of emergency vehicles. Such areas must be approved by the Owner prior to use by the contractor.
1. Staging and storage areas shall be located wholly within the contract limit lines and site enclosure fence.
  2. All loading and unloading operations shall occur inside the contract limit lines and behind the site enclosure fence.
  3. Storage of materials and equipment outside the site enclosure fence or on City streets is absolutely prohibited.
  4. Prior to final completion, perform all cleanup, disposal, grading, topsoiling, seeding and other work as necessary to restore the entire staging/storage area to its original condition.
- G. Verification of Underground Utilities: Contractor shall have the responsibility to verify the actual locations of existing underground utility lines. Should verified underground utility locations conflict with excavation required in connection with the work, Contractor shall notify the Owner's Project Manager immediately. Hand excavation shall be required at locations in close proximity to verified existing utilities.
1. The Owner does not guarantee the accuracy and completeness of information shown on any contract drawings for underground utilities; Contractor must be responsible for ascertaining all facts concerning utility locations.
  2. Damage to existing underground utilities, caused as a result of Contractor's negligence or failure to comply with the requirements listed herein, shall be repaired and/or replaced at Contractor's expense, to the complete satisfaction of the Owner and utility company by close of business of the day of damage.
- H. Cleaning and Trash Disposal: Comply with requirements specified in Section 01500, "Temporary Facilities".

## 1.8 PROTECTION OF PERSONS AND PROPERTY

- A. Safety Precautions and Programs: Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. He shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent, unless otherwise designated by the Contractor, in writing, to the Owner.
- B. Protection of Persons: Contractor shall take all necessary precautions for the safety of employees on the work, and shall comply with all applicable provisions of Federal and State safety laws, union safety regulations, and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the work is being performed. Particular attention is called to the requirements of the Federal Occupational Safety and Health Act (OSHA). In connection with the work of its own forces, Contractor shall direct and properly maintain, at all times, as required by the conditions and progress of the work, all necessary safeguards for the protection of workers and the public and shall post danger signs warning against the hazards created by such features of construction as protruding nails, hoists, well

holes, elevator hatchways, scaffolding, window openings, stairways and falling materials.

1. Security/protection provisions are specified in "Temporary Facilities" section.
- C. Protection of Work and Property: Contractor shall take all precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:
  1. All the work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor or any of his Subcontractors, or Sub-subcontractors; and
  2. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.
    - a. Refer to "Temporary Facilities" section for specific requirements concerning fencing around existing trees.
- D. Emergencies: In any emergency affecting the safety of persons or property, Contractor shall act with diligence, at his discretion, to prevent threatening injury, damage or loss. In such case, he shall immediately notify the Owner, of the action taken and shall forthwith prepare and submit a detailed and documented report to the Owner and the Architect.
- E. Insurance and Indemnification: Comply with requirements of the Contract Agreement.

#### 1.9 SPECIAL REPORTS

- A. General: Except as otherwise indicated, submit special reports directly to Owner within one day of occurrence requiring special report, with copy to Architect/Engineer and others affected by occurrence.
- B. Reporting Unusual Events: When an event of unusual and significant nature occurs at site, the Contractor shall prepare and submit a special report listing chain of events, persons participating, response by Contractor's personnel, evaluations of results or effects, and similar pertinent information. When such events are known or predictable in advance, it is the responsibility of the Contractor to advise the Owner in advance at earliest possible date.
- C. Reporting Accidents: Contractor shall prepare and submit reports of significant accidents, at site and anywhere else work is in progress. Record and document data and actions; comply with industry standards. For this purpose, a significant accident is defined to include events where bodily injury is sustained, or property loss of substance is sustained, or where the event posed a significant threat of loss or personal injury.

#### 1.10 SUBCONTRACTOR, MATERIAL APPROVAL

- A. Material Approval: Contractor shall submit to the Owner and Architect, for approval, a list of all vendors and manufacturers for the supply of materials and equipment, whether specified or not, starting within fifteen (15) calendar days after award of contract; said list shall be complete within forty-five (45) days thereafter. In instances where specified materials and equipment are subject to the Owner's and Architect's approval by way of the submittal process, no contract shall be entered into with any vendor, supplier or manufacturer before the Owner and Architect have approved his name in writing.
- B. Subcontractor Approval: Contractor shall, beginning within fifteen (15) calendar days after award of contract and ending within forty-five (45) days thereafter, notify the Architect and

Owner in writing of the names of all subcontractors proposed for the work, and shall not employ any without prior written approval of the Owner, or any that Owner may within a reasonable time reject.

#### 1.11 TRADESMEN AND WORKMANSHIP STANDARDS

- A. General: Contractor shall instigate and maintain procedures to ensure that tradesmen performing work at site are skilled and knowledgeable in methods and craftsmanship needed to produce required quality-levels for workmanship in completed work. Remove and replace work, which does not comply with workmanship standards as specified and as recognized in the construction industry for applications indicated. Remove and replace other work damaged or deteriorated by faulty workmanship or its replacement.
- B. Availability of Tradesmen: At each progress or job meeting, Contractor shall review availability of tradesmen and projected needs to accomplish work as scheduled. Require each entity employing tradesmen to report on current and pending trade actions and jurisdictional matters, which might affect progress of work. Where possible dispute or delay is identified, consider alternatives and take actions to avoid disputes and delays.
- C. Labor Peace Clause:
  - 1. The Contractor agrees that in the performance of the work called for under these Contract Documents, it will employ only such labor as will not delay or interfere with the speedy and diligent progress of the project and as will be acceptable to and work in harmony with all other workmen employed by the Owner.
  - 2. In the event of labor difficulties (including, but not limited to, strikes, walkouts, picketing, boycotts, shutdowns, or inability to obtain a sufficient number of competent laborers or mechanics), which interfere with the work, or any part thereof, it shall be the responsibility of the contractor to take all measures necessary and possible to insure the projects progress and completion as prescribed by the time schedule including, but not limited to, seeking injunctive relief in an appropriate Court of Common Pleas, filing an unfair labor practices charge(s) with the National Labor Relations Board, discharging employees who engage in an unprotected strike or work stoppage, or any other applicable legal or equitable action related to the aforesaid labor difficulty which occurs in connection with the performance of this contract.
  - 3. In the event of a strike or stoppage of work resulting from a dispute involving or affecting the labor employed by the contractor (including subcontractors and suppliers), the Owner may, at its option, terminate this contract. However, where practicable the contractor will give subcontractors 24 hours to resolve the strike or stoppage of work before terminating its contract. In the event there is a conflict between this clause and any other agreement between contractor and the Owner, including but not limited to other provisions of this contract, other written agreements and verbal agreements, this clause will take precedent. In the event of such termination, the Owner shall have the right to take possession, for the purpose of completing such work, of all materials, tools, and appliances on its premises and employ any person or persons to finish the work and provide the materials and labor for such work. The Contractor shall not be entitled to receive any further payments under this agreement until the work shall be finished completely, at which time the contractor shall be paid whatever balance is found to be due to contractor for amounts expended by it either for labor, materials, or otherwise, plus contractors percentage of profit as provided in this agreement, less, however such expenses or damages as the Owner may suffer by so completing the work. The Contractor shall not be entitled to prospective profits on portions of the project not performed by it or with respect to the materials not furnished by it. Further, it is understood and agreed that should the expenses to the Owner in completing the contract be increased by reason of such

discontinuance of the services of this contractor, then this contractor shall be responsible to the Owner for such entire increase in addition to the other expenses or damages referred to above.

#### 1.12 INSPECTIONS, TESTS AND REPORTS

- A. General: Required inspection and testing services are intended to assist in determination of probable compliances of the work with requirements, but do not relieve Contractor of responsibility for those compliances, or for general fulfillment of requirements of contract documents. Specified inspections and tests are not intended to limit Contractor's quality control program. Afford reasonable access to agencies performing tests and inspections.
- B. Inspection and Testing by Independent Agencies: General requirements are specified in "Quality Control Services" section of these specifications (Section 01400). Particular requirements are specified in the technical sections (Divisions 02 through 48).
- C. Inspection and Testing by Authorities with Jurisdiction: If the Contract Documents, laws, ordinances, rules, regulations or order of any public authority having jurisdiction require any portion of the Work to be inspected, tested or approved, the Contractor shall give the Owner not less than five (5) working days notice in writing of its readiness for inspections or testing. The Contractor shall bear all costs of such inspections, tests or approvals conducted by public authorities.
- D. Inspection and Testing by Contractors: When inspections and tests are required by the technical sections of these specifications to be performed by Contractors on installed materials and equipment, all such inspections and tests shall be conducted in the presence of, and upon timely notice to, the Owner, and the results thereof approved prior to acceptance of the installation. Fuel, power and any other items or services required for the proper inspecting and testing of equipment and for the period of instructing the Owner's operating personnel shall be at the cost and expense of the Contractor furnishing such equipment.
- E. Special Inspection and Testing: If the Owner or Architect/Engineer determines that any Work requires special inspection, testing or approval, not otherwise required herein, he will instruct the Contractor to order such special inspection, testing or approval, and the Contractor shall give notice as provided in subparagraph C. If such special testing or inspection reveals a failure of the Work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the Architect/Engineer's additional services made necessary by such failure; otherwise the Owner shall bear all costs and an appropriate Change Order will be issued.

#### 1.13 PROGRESS PHOTOGRAPHS

- A. Refer to Specification Section 01300, "Submittals" for requirements pertaining to Progress Photographs.
- B. Provide photographs of the site and construction throughout progress of Work produced by an experienced photographer or job superintendent experienced in taking construction photographs, acceptable to the Owner.
- C. Take photos in a timely fashion to allow for their submission with each application for a payment and/ as follows (as applicable):
  - 1. Installation of site utilities.
  - 2. Installation of footings.

3. Installation of foundations.
  4. Building pad proof roll.
  5. Building pad sub grade (vapor barrier and stone).
  6. Installation of concrete floors, decks, walls, etc.
  7. Installation of masonry for stair towers, elevator, exterior walls, etc.
  8. Installation of structural steel, steel deck and joist, etc.
  9. Rough grading.
  10. Installation of parking lot paving, parking lot lighting, line stripping, etc.
  11. Installation of interior and exterior framing.
  12. Plumbing and electrical rough-ins.
  13. HVAC ductwork and units.
  14. Installation of telecommunications cabling and devices.
  15. Installation of roofing.
  16. Installation of windows, doors, hardware, etc.
  17. Enclosure of walls and ceilings.
  18. Interior and exterior finishes.
  19. Installations of millwork, casework, trim work, etc.
  20. Landscaping
  21. Final Completion.
- D. Digital PDFs: Color photos. 4" X 8" or larger of each view. Provide enough photos at each stage of construction to give someone not familiar with the Project a clear understanding of the progress of the work. Review photos with the Owner's representative at each stage of construction requiring photographs. The Owner will determine if additional photos will be needed.
1. PDF format.
  2. Identify each print. Identify name of Project, orientation of view, date and time of view.
- E. Deliver prints with each Application for Payment or at times specified by Owner with transmittal letter.

#### 1.14 MANAGEMENT SOFTWARE

- A. The contractor to be provided a user account by the university to access ebuilder. Ebuilder is a web-based project management software solution to be used by the architects, consultants, construction manager and owner. The Contractor shall utilize this software solution throughout the project duration for all related project documentation including, but not limited to Requests for Information, submittals, daily reports, correspondence, meeting minutes, change orders, etc.

#### 1.15 REQUESTS FOR INFORMATION

- A. The Contractor is to prepare and submit a Request for Information (RFI) through web-based project management tool for action when a clarification and/or additional information is required to perform an activity of work.
- B. The request must include a drawing and/or specification reference when applicable and must also include a proposed solution for review by the Architect. Requests not provided with a recommended solution, if applicable, will be returned to the Contractor with no action until such recommendation is provided.
- C. The Construction Manager and Architect will endeavor to respond to requests in a timely manner so not to impact onsite activity. It is the Contractor's responsibility to review the

Contract Documents thoroughly for planned work and submit a request with sufficient time for the Construction Manager and Architect to review and respond. If the Contractor fails to carry out this responsibility, The Contractor will not be entitled to an extension of time and/or additional incurred costs should the request impact construction progress.

## PART 2 - PRODUCTS (NOT APPLICABLE)

## PART 3 - EXECUTION

### 3.1 GENERAL INSTALLATION PROVISIONS

- A. Pre-Installation Conference: Well in advance of installation of every major unit of work which requires coordination and interfacing with other work, Contractor shall meet at project site with subcontractors, installers and representatives of manufacturers and fabricators who are involved in or affected by unit of work, and in its coordination or integration with other work which has preceded or will follow. Contractor shall advise Owner and Architect of scheduled meeting dates. At each meeting review progress of other work and preparations for particular work under consideration, including requirements of contract documents, options, related change orders, purchases, deliveries, shop drawings, product data, quality control samples, possible conflicts, compatibility problems, time schedules, weather limitations, temporary facilities, space and access limitations, structural limitations, governing regulations, safety, inspection and testing requirements, required performance results, recording requirements, and protection. Contractor shall record significant discussions of each conference, and agreements and disagreements, along with final plan of action. Distribute record of meeting promptly to everyone concerned, including Architect/Engineer and Owner.
  - 1. Do not proceed with the work if associated pre-installation conference cannot be concluded successfully. Instigate actions to resolve impediments to performance of the work and reconvene conference at earliest date feasible.
- B. Installer's Inspection of Conditions: Require Installer of each major unit of work to inspect substrate to receive the work, and conditions under which the work will be performed, and to report (in writing to Contractor) unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- C. Manufacturer's Instructions: Where installations include manufactured products, comply with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in contract documents.
- D. Inspect each item of materials or equipment immediately prior to installation and reject damaged and defective items.
- E. Provide attachment and connection devices and methods for securing work properly as it is installed; true to line and level, and within recognized industry tolerances if not otherwise indicated. Allow for expansions and building movements. Provide uniform joint widths in exposed work, organized for best possible visual effect. Refer questionable visual-effect choices to Architect for final decision.
- F. Recheck measurements and dimensions of the work, as an integral step of starting each installation.



- G. Install work during conditions of temperature, humidity, exposure, forecasted weather, and status of project completion, which will ensure best possible results for each unit of work, in coordination with entire work. Isolate each unit of work from non-compatible work, as required to prevent deterioration.
  - H. Coordinate enclosure (closing-in) of work with inspections and tests, so as to minimize necessity of uncovering work for that purpose.
  - I. Mounting Heights: Except as otherwise indicated, mount individual units of work at industry-recognized standard mounting heights, for applications indicated. Refer questionable mounting height choices to Architect/Engineer for final decision.
- 3.2. The contractor shall include in his/her proposal the cost of all control wiring and its installation for all mechanical equipment including, but not limited to, heating, ventilating and air conditioning systems, ATC systems, boilers, remote monitoring systems, etc. which systems require electrical control wiring. The contractor shall employ a sub-contractor approved by the University for all such control wiring. The sub-contractor shall provide a final certificate of electrical inspection of the control wiring. Installed or control wiring must connect to a point of electrical power supply as shown on the contract documents.

### 3.3 CHASES, RECESSES AND OPENINGS

- A. Contractor shall build chases, recesses, openings, channels and flues, and shall leave or create holes where shown on drawings, or where directed for piping, electrical conduits, switchboxes, panelboards, flues and ducts, or any other feature of the mechanical and electrical work. All trades requiring chases, recesses, openings, etc. shall furnish to the Contractor, complete detailed drawings for all chases, recesses and openings required in connection with such work in ample time to allow the construction to proceed without interruption or delay. Comply with requirements of "Submittals" section of these specifications.
  - 1. Contractor shall close, build in and finish around or over all chases, recesses, openings, etc. after installation of mechanical and electrical work has been completed. Should any fail to furnish the above required information in time, he shall, at his own expense, arrange for all cutting, rebuilding, patching and finishing, but shall employ the Contractor whose work must be cut to do so.
  - 2. Contractor shall obtain prior written approval from the Architect/Engineer and the Owner before cutting or boring through beams, floor construction or supporting members.

### 3.4 SLEEVES, BUILT-IN ITEMS

- A. Each trade shall be responsible for furnishing and setting of sleeves, built-in items, anchors, inserts, etc. for his work. Contractor shall build these items into the construction.
  - 1. Comply with requirements of "Submittals" section in the preparation of sleeve drawings.

### 3.5 CUTTING AND PATCHING

- A. General: Do not cut-and-patch structural work in a manner resulting in reduction of load-carrying capacity or load/deflection ratio; submit proposed cutting and patching to Architect/Engineer for structural approval before proceeding. Do not cut-and-patch operational elements and safety-related components in a manner resulting in reduction of capacities to perform in manner intended or resulting in decreased operational-life,

increased maintenance, or decreased safety. Do not cut-and-patch work which is exposed on exterior or exposed in occupied spaces of building, in a manner resulting in reduction of visual qualities or resulting in substantial evidence of cut-and-patch work, both as judged solely by Architect. Remove and replace work judged by Architect to be cut-and-patched in a visually unsatisfactory manner.

1. Contractor shall do all cutting, fitting, adjusting and patching as may be required to permit the several parts to properly come together as intended and indicated.
  2. Engage original Fabricator/Installer to perform cutting-and-patching of structural work, operational/ safety-related components, and visually exposed work; or, if not available, engage only recognized experts; employ only proven methods.
  3. Do not cut or alter work performed under separate contracts without the Architect's written permission.
  4. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specific requirements and methods needed for proper performance of the work of this Section.
  5. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Beginning new work means acceptance of existing conditions.
  6. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
  7. Examine and verify specific conditions described in individual specification sections.
  8. Verify that utility services are available, of the correct characteristics, and in the correct locations.
  9. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.
- B. Materials: Except as otherwise indicated or approved by Architect/Engineer, provide materials for cutting-and-patching which will result in equal-or-better work than work being cut-and- patched, in terms of performance characteristics and including visual effect where applicable. Use materials identical with original materials where feasible and where recognized that satisfactory results can be produced thereby.
- C. Temporary Support and Protection: Provide adequate temporary support for work to be cut, to prevent failure. Do not endanger other work. Provide adequate protection of other work during cutting-and-patching, to prevent damage; and provide protection of the work from adverse weather exposure.
- D. Cut work using methods least likely to damage work to be retained and work adjoining.
1. Where physical cutting action is required, cut work with sawing and grinding tools, not with hammering and chopping tools. Core drill openings through concrete work. Comply with the requirements of applicable sections of Division 02 where cutting-and-patching requires excavating and backfilling.
  2. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
  3. At penetrations of fire rated walls, partitions, ceilings, or floor construction, completely seal voids with fire rated materials in accordance with Section 07841 to full thickness of the penetrated elements.
  4. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
- E. Patch with seams, which are durable and as invisible as possible. Comply with specified tolerances for the work.

1. Where feasible, inspect and test patched areas to demonstrate integrity of work.
- F. Restore exposed finishes of patched areas; and, where necessary extend finish restoration onto retained work adjoining, in a manner, which will eliminate evidence of patching.
  1. Where patch occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area has received prime and base coats.
- G. Execute cutting and patching including excavation and fill to complete the work, to uncover work to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide opening in the work for penetrations of mechanical and electrical work, to execute patching to complement adjacent work, and to fit Products together to integrate with other work.
- H. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original conditions.
- I. **ALL CUTTING AND PATCHING SHALL BE CONSIDERED PART OF THE BASE BID PRICE WHEN THE WORK IS REQUIRED AS PART OF THE OVERALL PROJECT. NO ADDITIONAL PAYMENT WILL BE CONSIDERED FOR WORK OF THIS SECTION UNLESS ALL APPLICABLE PARTIES OBTAIN PRIOR AUTHORIZATION OR WRITTEN APPROVAL.**

### 3.6 UNCOVERING AND CORRECTION OF WORK

- A. Comply with requirements of the General Conditions of the Contract, and with additional requirements specified herein.
  1. Subsequent Disclosure of Faulty Work: Failure of Owner or Architect/Engineer to exercise powers of rejection or condemnation against the work of the Contractor during construction shall not be construed as an acceptance on Owner's part or Architect/ Engineer's part that Contractor's work has been faithfully performed, if the fact be otherwise.

### 3.7 PROJECT CONDITIONS

- A. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- C. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and air from discharge of noxious, toxic substances, and pollutants produced by construction activities. Comply with all governmental and code requirements.

### 3.8 PREPERATION FOR CUTTING AND PATCHING AND/OR NEW WORK.

- A. Prepare surfaces and remove surface finishes to provide for proper installation of work and finishes.
- B. Clean substrate surfaces prior to applying next material or substance.

- C. Seal cracks or openings of substrate prior to applying next material or substance.
- D. Apply manufacturers required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

### 3.9 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Owner's Representative and Architect of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect/Engineer and Owner's Representative the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Utilize recognized engineering survey practices.
- F. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
  - 1. Site improvements including but not limited to pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations, etc.
  - 2. Building foundation, column locations, all floor elevations, stairwells, elevator shafts, machine and mechanical rooms, etc.
  - 3. All other work as necessary to complete all the requirements of the contract documents.
- G. Periodically verify layouts by same means.
- H. Maintain a complete and accurate log of control and survey work as it progresses.

### 3.10 GENERAL INSTALLATION REQUIREMENTS

- A. Install Products as specified in individual sections and in accordance with manufacturer's recommendations.
- B. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new Work abuts or aligns with existing, perform a smooth and even transition.
- C. When existing finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendations to the Architect and Owner.

### 3.11 CLEANING AND PROTECTION

- A. General: During handling and installation of work at project site, Contractor shall clean and protect work in progress and adjoining work on a basis of perpetual maintenance. Apply suitable protective covering on newly installed work where reasonably required to ensure freedom from damage or deterioration at time of substantial completion; otherwise, clean and perform maintenance on newly installed work as frequently as necessary through remainder of construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

- B. Removal of all debris and rubbish resulting from or relating to the construction work; rubbish shall not be thrown from building openings above the ground floor unless confined within chutes.
1. Progress Cleaning:
- a. Maintain areas free of waste material, debris, and rubbish (on a daily basis). Maintain site in a clean and orderly condition, as determined by the Owner.
  - b. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
  - c. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
  - d. Collect and remove waste materials, debris, and rubbish from site periodically and dispose of off-site.
  - e. Protect installed work and provide special protection where specified in individual specification sections.
  - f. Provide temporary and removable protection for installed Products. Control activity during and after installation in the immediate work area to prevent damage.
  - g. Protect finished floors and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials appropriate for the task involved.
- C. Limiting Exposures of Work: To extent possible through reasonable control and protection methods, Contractor shall supervise performance of work in a manner and by means which will ensure that none of the work, whether completed or in progress, will be subjected to harmful, dangerous, damaging, or otherwise deleterious exposures during construction period. Such exposures include (where applicable, but not by way of limitation) static loading, dynamic loading, internal pressures, external pressures, high or low temperatures, thermal shock, high or low humidity, air contamination or pollution, water, ice, solvents, chemicals, light, radiation, puncture, abrasion, heavy traffic, soiling, bacteria, insect infestation, combustion, electrical current, high speed operation, improper lubrication, unusual wear, misuse, incompatible interface, destructive testing, misalignment, excessive weathering, unprotected storage, improper shipping/handling, theft and vandalism.
- D. Construction Debris: The Contractor shall intermittently remove waste and rubble so that at no time shall there be undue accumulations. Upon completion, the Contractor shall dress up all areas affected by this work whether inside or outside the boundary of the Project. Loading, crating, hauling and dumping will be at the contractor's expense.
- E. Rubbish: The Contractor shall provide covered metal trash cans in sufficient quantity to accept the accumulation of rubbish and garbage from lunch and the like of employees of all Contractors working on site.
- 1. The Contractor shall instruct his and his subcontractors' employees to deposit their trash and garbage in these containers and not elsewhere about the site; and also not to use the containers for construction scraps, rubbish, trash and surplus materials.
  - 2. The Contractor shall empty these containers daily and haul the rubbish to a legal disposal site off the property.
- F. Roads and Pathways:
- 1. The Contractor is responsible for the removal of construction dirt and debris in public areas on the site and in the surrounding areas serving the site.
  - 2. Dirt and mud tracked onto streets by the Contractor or its subcontractors is to be

immediately cleaned up by the Contractor to the satisfaction of the Owner and the local municipal authorities.

- G. Trucks: All trucks leaving the construction area are to be covered in accordance with NJDOT over the road requirements. Trucks leaving the site are to be clean and free of mud or other materials.
- H. Quality Assurance: University streets and pathways are to be maintained in a clean safe condition at all times. Under no circumstances shall the Contractor leave the site each day without inspecting and verifying that streets and paths to the construction site, access areas, lay down areas, and gates in the area of the site are clean of all construction related materials and are clean and safe for use by the Rowan University population. The Contractor will immediately correct any violation of this provision upon notification by the Owner.

### 3.12 CONSERVATION AND SALVAGE

- A. General: It is a general procedural requirement for Contractor's supervision and administration of the work that construction operations be carried out with maximum practical consideration for conservation of energy, water and materials; and with maximum practical consideration for salvaging materials and equipment involved in performance of the work but not incorporated therein.

END OF SECTION 012400

## 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:
  - 1. Section 012100 "Allowances" for products selected under an allowance.
  - 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.
- B. Equivalents: When the products, materials, equipment, and methods are the same to the specified, but supplied and/or manufactured by a firm or vendor not listed in the specifications. In accordance with N.J.S.A. 18A:64-64, equal products, materials and equipment will be considered by the Architect for all products, unless sole source is approved, specified in the bid documents regardless if the language "or equivalent" and/or "or equal" is stated in each specification.

#### 1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying 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 or form acceptable to Architect.
  - 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 seven 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.
- B. Substitutions may be permitted by the Architect, if, in his opinion, the requirements of the proposed substitution comply with the requirements specified for the material, article or piece of equipment; however, the Architect is not required to permit substitutions pursuant to the case of Whitten Corporation vs. Massachusetts, April 12, 1974, affirmed by the Federal First Circuit Court, December 14, 1974.
- C. The Architect has no obligation, after award of contract, to consider any brand other than those named in the Contract Documents. However, the Contractor may submit substitutes to the



Architect for review, fully documented and certified, and accompanied by his proposal for a deduction in the Contract Sum.

- D. Contractors' request for substitutions will be received and considered when extensive revisions to Contract Documents are not required and changes are in keeping with general intent of Contract Documents; when timely, fully documented to show compliance with all aspects of the specified item and properly submitted; and when one or more of the following conditions is satisfied, all as judged by Architect. Otherwise, requests will be returned without action except to record noncompliance with these requirements.
1. Where request is directly related to an "or approved equal" clause or other language of same effect in contract documents.
  2. Where required product, material or method cannot be provided within Contract Time, but not as a result of Contractors' failure to pursue the work promptly or coordinate various activities properly.
  3. Where required product, material or method cannot be provided in a manner which is compatible with other materials of the work, or cannot be properly coordinated there within, or cannot be warranted (guaranteed) as required, or cannot be used without adversely affecting Owners' insurance coverage on completed work, or will encounter other substantial noncompliance which are not possible to otherwise overcome except by making requested substitution, which Contractor thereby certifies to overcome such incompatibility or other noncompliance as claimed.
  4. Where required product, material or method cannot receive required approval by a governing authority, and requested substitution can be so approved.
  5. Where substantial advantage is offered Owner, in terms of cost, time or other valuable considerations, after deducting offsetting responsibilities Owner may be required to bear, including additional compensation to Architect for redesign and evaluation services, increased cost of other work by Owner or separate Contractors, and similarly considerations.
  6. Substitutions will be allowed for equipment or materials no longer manufactured.
- E. Contractors' submittal of, and Architects' acceptance of, shop drawings, product data or samples which indicate work not complying with requirements of Contract Documents, does not constitute an acceptable and valid request for, nor approval of, a substitution.

## 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.

## 1.7 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 10 days after the Notice of Award. 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 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

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## 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 01 Specification Sections, apply to this Section. In the event of any conflicts between the requirements of these Sections, the more stringent requirement shall apply.

#### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
  - 1. Division 01 Section "Allowances" for procedural requirements for handling and processing allowances.
  - 2. Division 01 Section "Unit Prices" for administrative requirements for using unit prices.
  - 3. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

#### 1.3 MINOR CHANGES IN THE WORK

- A. Architect may issue through Owner's Project Manager supplemental instructions authorizing Changes in the Work, not involving adjustment to the Contract Time, as "Architects Supplemental Instructions" (ASI). Architects Supplemental Instructions may or may not involve adjustments to the contract sum. THERE WILL BE NO ADJUSTMENTS TO THE CONTRACT TIME ALLOWED FOR THIS PROJECT.
  - 1. For ASI's involving no adjustment to the contract sum or time, the contractor is authorized to execute the change or clarification immediately.
  - 2. For ASI's resulting in an adjustment to the contract sum, do not consider them instructions either to stop work in progress or to execute the proposed change without obtaining written authorization from the Owner. Written authorization can include the provisions of the general conditions, Article 14, paragraphs 14.5.3 and 14.7.1, an approved change order or a Construction Change Directive.
- B. The technical specifications may refer to certain brand name products by name/or catalog number. This is done to establish standards of quality. Is it not being done to intentionally eliminate competition. If the contractor deems a product equivalent or better quality from another supplier or manufacture where fully suitable in design and manufacturing, see Section 016350 Substitution Procedures.

#### 1.4 PROPOSAL REQUESTS

- A. In the event the Contractor believes that any change directed by the Owner or Architect would entitle it to additional compensation to complete its work under this contract, **the Contractor shall immediately notify the Owner's Project Manager of this fact WITHIN 48 HOURS OF RECEIPT OF THE CHANGE REQUESTED.** The contractor shall then

prepare and submit an original of the Change Order Request (COR) with all supporting documentation to the Owner's Project Manager and submit two (2) copies of the Change Order Request (COR) with all supporting documentation to the Architect and University within five (5) calendar days of its receipt of the directive by the Owner and/or Architect.

- B. Owner-Initiated Proposal Requests (OIPR): Owner may issue proposal requests or may have the Architect issue such requests. In any event a detailed description of proposed changes in the Work will be submitted to the contractor that may require adjustment to the Contract Sum. THERE WILL BE NO ADJUSTMENTS TO TIME FOR ANY GIVEN CHANGE ORDER REQUESTED. If necessary, the description will include supplemental or revised Drawings and Specifications.
1. OIPR issued by Architect are for information only. For ASI's resulting in adjustments to the contract sum, do not consider them instructions either to stop work in progress or to execute the proposed change without first obtaining written authorization from the Owner.
  2. If the contractor feels the ASI or OIPR requires a change to the contract sum then the contractor shall notify the Owner's Project Manager of this fact within 48 hours of receipt of the ASI or OIPR directive.
  3. Within five (5) business days after receipt of directive, ASI or OIPR from the Owner, submit a Change Order Request (COR) estimating cost adjustments to the Contract Sum necessary to execute the change. The contractor shall then prepare and submit an original of the COR with all supporting documentation to the Owner's Project Manager and submit two (2) copies of the COR with all supporting documentation to the architect.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor directly attributable to the change.
      - 1) Labor shall be broken down by man-hours, hourly wages, fringe benefits per hour and any other benefits payable.
    - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float however the date of Substantial and Final Completion cannot be extended.
- C. In the event that the Contractor encounters a condition that it considers a change, the Contractor shall immediately notify the Owner's Project Manager prior to disturbing the condition and shall then prepare and submit an original of the COR with all supporting documentation to the Owner's Project Manager and two (2) copies of a Change Order Request with all required supporting documentation to the architect within five (5) calendar days of encountering the condition. The condition shall not be disturbed until the Owner's Project Manager has inspected the condition.
- D. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a Change Order Request (COR) to Owner's Project Manager. The contractor shall prepare and submit one (1) original of the COR with all supporting documentation to the Owner's Project Manager and submit two (2) copies of the COR with all supporting documentation to the architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float however the date of Substantial and Final Completion cannot be extended.

E. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

#### 1.5 ALLOWANCES (**IF APPLICABLE ON A GIVEN PROJECT**)

- A. Allowance Adjustment: To adjust allowance amounts, base each Allowance Request Proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins. **Only allowances included as part of the Bid Price will be considered for an Allowance Authorization. All other Proposals must be hard costed.**
1. Include installation costs in purchase amount only where indicated as part of the allowance.
  2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
  3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to allowances.
  4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- 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 Contractor's handling, labor, installation, overhead, and profit. Submit claims within ten (10) business days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than ten (10) business days after such authorization.
1. Do not include 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 the Contract Documents.
  2. No change to 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.
- C. ***Use the same procedure(s) followed for handling Change Order Requests (COR's) and Change Orders with Allowances (except use Allowance Forms rather than Change Order Forms).***

#### 1.6 CHANGE ORDER PROCEDURES

- A. Upon the Owner's approval of a Change Order Request (COR), the Owner will direct the

Architect to issue a Change Order for signatures of the Contractor and Owner on AIA Document G701.

1. The Change Order breakdown shall be in sufficient detail to permit an analysis of all material, labor, equipment, sub-contract and overhead costs as well as profit. Any amount proposed for sub-contracts shall be supported by a similar price breakdown.
- B. Each Change Order must contain a detailed description of the change and the amount by which the Contract Price will be increased or decreased.
- C. COMPUTATION OF ADDITIONAL COMPENSATION
  1. In connection with any request for additional compensation the Contractor shall furnish a price breakdown, as follows:
    - a. Labor shall be broken down by the man-hour, hourly wages, fringe benefits per hour and any other benefits payable by the Contractor;
    - b. Materials shall be broken down by quantity and unit prices.
  2. Unless otherwise directed, the breakdown shall cover all work involved in the change whether such work was deleted, added or changed.
  3. The breakdown shall be in sufficient detail to permit an analysis of all material, labor, equipment, sub-contract and overhead costs as well as profit. Any amount proposed for sub-contracts shall be supported by a similar price breakdown.
  4. The following rates shall apply in computing indirect costs and profit for the negotiation of additional compensation under all provisions of this contract, which provide for such adjustments that do not exceed twenty-five thousand dollars (\$25,000.00). The resulting change in the contract amount will include the indirect impact cost of extended performance computed in accordance with the terms of this article and no further consideration of such costs arising from the specific modification will be given. The percentages for overhead and profit shall be negotiated and may vary according to the nature, extent and complexity of the work involved. If not negotiated prior to the start of construction then the rates herein designated shall apply. The percentages shall be applicable for deleted work as well as additional work. When a change consists of both added and deleted work, the applicable percentages shall be applied to the net cost or credit. In any event, the percentages shall not exceed the sum of the following:
    - a. Overhead will be the sum of ten percent (10%) of direct labor costs.
      - 1) For the purpose of the article, the term direct labor shall include all labor by contractor's employees necessary to perform the actual work on site. Foremen, equipment operators and skilled, semi-skilled and common laborers directly assigned to the specific operation are direct labor; project managers, superintendents, office personnel, and subcontractors are not direct labor.
      - 2) The term direct labor costs shall consist of the contract or actual payroll rate of wage per hour and fringe benefits paid for each and every hour that such employees are actually engaged in the performance of the work. Overhead will be the sum of ten percent (10) % of direct material costs.
    - b. Overhead will be the sum of ten percent (10%) of direct material costs.
      - 1) For the purpose of the article, the term direct material costs shall consist



of the actual costs of the materials, including applicable tax and transportation charges

- c. For rented equipment, an hourly rental rate will be used which will be determined by using the monthly rental rates taken from the current edition of the rental rate blue book for construction equipment and dividing it by one hundred seventy-six (176). An allowance will be made for operating costs for each and every hour the equipment is actually operating in accordance with the rate listed in the aforesaid rental book. The contractor will be allowed only sixty-five percent (65%) of the rental rate on contractor owned equipment.
- d. Bond premiums, insurance, payroll taxes and travel subsistence, if applicable, will be allowed at actual cost (only) for the equitable adjustment allowed. No mark-up will be allowed for overhead on these indirect cost items.
- e. The contractor's profit on the sub-contractor's work will be five percent (5%) of the sub-contractor's costs. Sub-contractor indirect costs will be computed in the same manner as for the contractor. The contractor agrees to incorporate this article in each of its sub-contracts.
- f. A profit of six percent (6%) where profit is allowable by the terms of the applicable contract provision shall be added to the contractor's total cost for the equitable adjustment allowed for the work conducted by the contractor's own workforce. Indirect costs will not be duplicated in direct costs.
- g. When more than one (1) tier of sub-contractors exists, they shall be treated as one (1) sub-contractor for the purpose of mark-ups.

D. ANY CONTRACTOR PERFORMING CHANGE ORDER WORK WITHOUT **WRITTEN** APPROVAL FROM THE OWNER DOES SO AT ITS OWN RISK.

- 1. Only the signature of an Assistant Vice President or above is authorized to give approval of a Change Order Request (COR) or Change Order (CO). The Owner's Project Manager is not authorized to approve change orders. The Owner's Project Manager is only authorized to verify the work in question is in addition to or outside the scope of work delineated on the original contract documents.

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect at the direction of the Owner's Project Manager may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost adjustments to the Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PERFORMANCE OF CHANGE ORDER WORK

- A. A contractor who performs any scope of work associated with a change order or allowance (if allowances are applicable on a given project) without receiving proper approval in accordance with all contract document requirements hereof does so at its own risk. The Contractor shall have waived any and all claims for additional compensation related to said changes or conditions encountered.

END OF SECTION 012600

## SECTION 012900 - PAYMENT 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. In the event of any conflicts between the requirements of these Sections, the more stringent requirement shall apply.

#### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
  - 1. Division 01 Section "Allowances" for procedural requirements governing handling and processing of allowances.
  - 2. Division 01 Section "Unit Prices" for administrative requirements governing use of unit prices.
  - 3. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 4. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

#### 1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

#### 1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
  - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
    - a. Application for Payment forms with Continuation Sheets.
    - b. Submittals Schedule.
  - 2. Submit the Schedule of Values submission to Architect and Owners Construction Manager in accordance with the general conditions and general conduct of work.
  - 3. Sub schedules: Where the Work is separated into phases requiring separately phased payments, provide sub schedules showing values correlated with each phase of payment.

- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items 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.
    - b. Name of Architect.
    - c. Architect's 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 the Work.
    - c. Name of subcontractor.
    - d. Name of manufacturer or fabricator.
    - e. Name of supplier.
    - f. Change Orders (numbers) that affect value.
    - g. Dollar values
    - h. Cost totals.
    - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
  3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
    - a. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed.
  4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
  5. 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.
    - b. The University may, in its sole discretion, pay the Contractor for material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the contractor at locations other than the site may also be taken into consideration if (1) such consideration is specifically authorized by the contract and (2) the contractor furnishes a form entitled "Contractor's Summary of Stored Materials" and agreement and bill of sale certification, respectively, for stored materials and (3) the contractor furnishes evidence of insurance for said materials or a bonded warehousing agreement.
  6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities. Allowances will only be accepted for items listed in the Bid Documents.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
  - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place must be shown as separate line items in the Schedule of Values.
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.
  - a. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

## 1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
  1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
  2. Submit three (3) copies of each Application for Payment, at least five (5) business days prior to the actual submission date as specified. This Application will be reviewed and adjusted by all parties (Architect, Owner and Contractor) at a **"PENCIL COPY REVIEW"** meeting prior to final approval.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. 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 per the General Conditions. The period covered by each Application for Payment starts on the day following the end of the preceding period and ends 15 days before the date for each progress payment.
- D. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Owner's Project Manager will return incomplete applications without action.
  1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
  2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- F. Transmittal: Submit 3 (three) signed and notarized original copies of each Application for

Payment to Owner's Project Manager by a method ensuring receipt within 24 hours. All copy's shall include 'Attachment to G702- Certification for Payment', Release of Liens Forms (included in the Contract Documents) entirely completed for the contractor, all subcontractors and anyone else whose payment is listed in the Schedule of Values for the application being requested, AIA G706 A-Contractors Affidavit..., Certified Payrolls and Monthly Work Force Reports, updated and current Construction Schedule, updated and current Submittal Log, and current Project Photograph's.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Release of Mechanic's Lien: With each Application for Payment, submit partial or final releases of mechanic's lien (as may apply) from every entity that is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
  2. When an application shows completion of an item, submit final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Submit final Application for Payment with or proceeded by final waivers from every entity involved with performance of the Work covered by the application that is lawfully entitled to a lien.
  5. Release Forms: Submit release of lien on forms, executed in a manner acceptable to Owner. (Use Form listed in Division 0 of the Specifications).
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
  2. Schedule of Values.
  3. Contractor's Construction Schedule (preliminary if not final).
    - a) A final schedule must be submitted prior to Owners payment of the second (2<sup>nd</sup>) progress payment.
  4. Products list.
  5. Schedule of unit prices.
  6. Submittals Schedule (preliminary if not final).
  7. List of Contractor's staff assignments.
  8. List of Contractor's principal consultants.
  9. Copies of building permits.
  10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  11. Initial progress report.
  12. Report of preconstruction conference.
  13. Certificates of insurance and insurance policies.
  14. Performance and payment bonds.
  15. Data needed to acquire Owner's insurance.
  16. Initial settlement survey and damage report if required.
  17. Current construction photographs as specified herein.
- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion

for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
  2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
  2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  3. Updated final statement, accounting for final changes to the Contract Sum.
  4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
  5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
  6. AIA Document G707, "Consent of Surety to Final Payment."
  7. Evidence that claims have been settled.
  8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
  9. Final, liquidated damages settlement statement.
- K. When Owner or Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question. Provide one (1) copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.
1. Any other information or documentation required by other provisions of the contract documents shall be supplied.
- L. In order to be proper an Application for Payment must include the following as applicable:
1. Total amount, payee name and address, department/agency, payee declaration, payee reference number and identification number.
  2. contract number, contractor's name, period of the Application, completion date, number of sheets, amount due this period, amount to date, retainage, certification by payee, certification signed by the Project Manager and Architect and approval of payment signed by the contracting officer or his/her designee, previous payment requests, total deductions and additions.
  3. In making progress payments for work, the University will retain ten percent (10%) of the approved invoice of payment until final acceptance and completion of all work covered by the contract.
  4. After fifty percent (50%) of the work has been completed, upon written request by the contractor and provided the contracting officer determines that the contractor's performance and progress have been satisfactory, the University will make partial payments thereafter in full of the approved payment amount. If, however, progress is not maintained in accordance with the approved schedule, the contracting officer may elect to reinstitute retainage of ten percent (10%) of amounts due to the contractor. The contracting officer shall have the sole authority to determine whether contractor's performance and progress warrant waiver of ten percent (10%) retainage.
- M. Upon acceptance and completion of each building or other clearly definable severable portion of the contract work for which the price is stated separately within the contract, payment may be made in full at the discretion of the contracting officer including retained

percentages thereon less authorized deductions.

- N. All authorized Applications are to be sent to the Owners authorized representative at the address provided at the pre-construction conference. Receipt shall start the prompt payment clock unless returned to the contractor for correction within thirty (30) calendar days after receipt. Reference section 10.2.4 (d) of the General Conditions.

#### 1.6 FINAL PAYMENT

- A. Upon final acceptance, the amount due the contractor under this contract shall be paid upon satisfactory completion by the contractor of all contract close-out requirements as required by the University, completion of a University audit on all contract values and payments and after the contractor shall have furnished the University with a final release of liens from the contractor and all subcontractors, sub-subcontractors, vendors, suppliers and any other entity affiliated with the contractor for completion of this project of any and all claims against the University arising by virtue of this contract other than claims in stated amounts as may be specifically excepted by the contractor from the release.
- B. Upon satisfying the above conditions, the contractor shall submit a properly executed Application for Final Payment to the University through the Owner's Project Manager. The University Controller shall date stamp the Application. This action by the University Controller shall constitute receipt of a properly executed State invoice application.
- C. If, for any reason, the contractor refuses final payment, the project shall be closed-out by the University unilaterally processing a final acceptance certificate. The University will hold all residual funds in escrow until all claims of the University and all contractors are satisfied.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 012900



## SECTION 013100 – COORDINATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, General Conduct of the Work and Special Requirements, Supplementary Conditions, and other Division 01 Specification Sections, apply to this Section. In the event of any conflicts between the requirements of these Sections, the more stringent requirement shall apply.

#### 1.2 SUMMARY

- A. This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:
  - 1. General project coordination procedures.
  - 2. Conservation.
  - 3. Coordination Drawings.
  - 4. Administrative and supervisory personnel.
  - 5. Cleaning and protection.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 01 Section "Field Engineering" specifies procedures for field engineering services, including establishment of benchmarks and control points.
  - 2. Division 01 Section "Submittals" for preparing and submitting the Contractor's Construction Schedule.
  - 3. Division 01 Section "Contract Closeout" for coordinating contract closeout.

#### 1.3 COORDINATION

- A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in the 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 to assure maximum accessibility for required maintenance, service, and repair.
  - 3. Make provisions to accommodate items scheduled for later installation.
- B. The mechanical, electrical and fire protection drawings are diagrammatic only and are not intended to show the alignment, physical locations or configurations of such work. Such work shall be coordinated by the Contractor and shall be installed to clear all obstructions, permit proper clearances for the work of other trades, satisfy all code requirements and present an orderly appearance where exposed at no additional cost to the Owner.
- C. Where necessary, prepare memoranda for distribution to each party involved, outlining

special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Prepare and coordinate scheduling, delivery and processing of submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
  2. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
  3. Coordinate space requirements, supports, and installation of mechanical and electrical work, which are indicated diagrammatically on the Drawings. Follow routing shown for pipes, ducts and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.
  4. Installation and removal of temporary facilities.
  5. Progress meetings.
  6. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
  7. Coordinate completion and clean-up of work of separate sections.
  8. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.
  9. Project closeout activities.
- E. Conservation: Coordinate construction operations to assure 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 in, the Work.

#### 1.4 SUBMITTALS

- A. Coordination Drawings: Prepare coordination drawings where careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.
1. Show the relationship of components shown on separate Shop Drawings.
  2. Indicate required installation sequences.
  3. Comply with requirements contained in Section "Submittals."
- a. Note the coordination drawing submittal requirements under Section 013300 "Submittals", paragraph 2.3.9

- B. Staff Names: Within fifteen (15) days of commencement of construction operations, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.

1. Post copies of the list in the Project meeting room, and the temporary field office.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.1 GENERAL COORDINATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

### 3.2 CLEANING AND PROTECTION

- A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.
- B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.
- C. 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.

END OF SECTION 013100

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## SECTION 013110 – REQUESTS FOR INTERPRETATION

### 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 provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. Requests for Interpretation (RFIs).
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

#### 1.3 DEFINITIONS

- A. RFI: Request from Owner, Construction Manager, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
  - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 30 calendar 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, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates 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.

## 1.5 REQUESTS FOR INTERPRETATION (RFIs)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
  2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Project name.
  2. Owner name.
  3. Owner's Project number.
  4. Name of Architect.
  5. Architect's Project number.
  6. Date.
  7. Name of Contractor.
  8. RFI number, numbered sequentially.
  9. RFI subject.
  10. Specification Section number and title and related paragraphs, as appropriate.
  11. Drawing number and detail references, as appropriate.
  12. Field dimensions and conditions, as appropriate.
  13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  14. Contractor's signature.
  15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. General RFI Procedure Requirements:
1. All RFIs shall be submitted directly to the University's Project Management Software System specificity establish for the Project. The University will supply a user account to the software and provide training.
    - a. All RFIs are to be sent to [shopdrawings@nkarchitects.com](mailto:shopdrawings@nkarchitects.com) and copied to the NKA project team.
    - b. All RFIs submitted through Trimble Unity Construct PMIS submit to above email address (Ball-In-Court) and copy the NKA project team.
  2. Post electronic submittals as PDF electronic files directly to Project Web site / Architect's FTP site specifically established for Project.
    - a. Architect, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for approval of Contractor's means and methods.
    - d. Requests for coordination information already indicated in the Contract Documents.
    - e. Requests for adjustments in the Contract Time or the Contract Sum.
    - f. Requests for interpretation of Architect's actions on submittals.
    - g. Incomplete RFIs or inaccurately prepared RFIs.
  2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
  3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to the General Conditions.
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 21 days of receipt of the RFI response. Owner will reject claims submitted later than 21 days after RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:
1. Project name.
  2. Name and address of Contractor.
  3. Name and address of Architect.
  4. RFI number including RFIs that were returned without action or withdrawn.
  5. RFI description.
  6. Date the RFI was submitted.
  7. Date Architect's response was received.
  8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013110



## SECTION 013200 – CONSTRUCTION PROGRESS SCHEDULE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions (Contract Administration Division Section D), General Conduct of the Work and Special Requirements, and other Division 01 Specification Sections, apply to this Section. In the event of any conflicts between the requirements of these Sections, the more stringent requirement shall apply.

#### 1.2 SUBMITTALS

- A. Within three (3) days after the date established in the Notice to Proceed, University Contract and/or purchase order submit preliminary schedule indicating the scope of work for the duration of the project. A Gantt chart format will be acceptable however the final approved schedule must be in both a Gantt chart and CPM schedule format. If another method other than CPM is used the critical path and float time must be established and programmed into the schedule.
- B. Initial Working CPM Schedule Submittal: To the extent necessary for the Contractor to reflect in the arrow diagram the plan for completion of this contract, the contractor shall meet with and furnish all necessary information for the preparation of the scheduling system within ten (10) calendar days after award of this contract. This information shall include, but not necessarily be limited to, logical sequencing of work operations; activity time estimated, intended crew flow, activity costs and estimated manpower requirements of each activity.
  - 1. The contractor shall be responsible to reflect all sub-contractor work as well as his/her own work in proper coordinated sequence on the network diagram. The contractor shall be prepared to meet as many times as necessary with the Owner's Project Manager for the timely development of the project schedule.

#### 1.3 SCHEDULE FORMAT

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number. At a minimum provide the following.
  - 1. Include a separate bar for each portion of work or operation.
  - 2. Identify the first workday of each week.
  - 3. Identify each critical path task or portion of work.
  - 4. Identify task durations, predecessors and dependent tasks.
  - 5. Identify milestone dates for completion/start of each critical path element.
- B. The contractor shall utilize the earliest scheduled start and finish dates in planning, coordinating and performing the work under this contract including all activities of sub-contractors, equipment vendors and suppliers.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.1 CONTENT

- A. Construction logic and activity time durations shall be established by the contractor subject to approval by the Owner's Project Manager consistent with contract requirements and reflective of proper coordination between trades.
- B. The Owner's Project Manager shall establish the specific level of detail to be reflected in the scheduling system.
- C. Seasonal weather conditions shall be considered in the planning and scheduling of all work influenced by high or low ambient temperatures for the completion of all contract work within the allotted contract time. In addition, appropriate allowances shall be made for anticipated time losses due to normal rain and snow conditions by statistically expanding the estimated time durations for weather sensitive activities with the constraint that the substantial completion deadline cannot change.
- D. The coordinated combined Progress Schedule the Contractor will develop shall incorporate the schedules of all Prime Contractors engaged on the project. The Schedule shall be in a form as specified herein and elsewhere in the contract documents and in sufficient detail to satisfy the Architect/Engineer and the University.
- E. The Progress Schedule based upon the Contractor's logic and time estimates shall indicate, in suitable detail for display, all significant features of the Work of each Contractor, including the placing of orders and anticipated delivery dates for critical items and all other critical path activities, submissions and approvals of Shop Drawings, all work activities to be performed by each Contractor and the beginning and time durations thereof, float time and the dates of substantial and final completion of the various branches of the Work.
  - 1. Show complete sequence of construction activity, with dates for beginning and completion of each element of construction.
  - 2. Identify each item by specification section number or per bid form breakdown.
  - 3. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
  - 4. Indicate delivery dates as milestones for Owner-furnished items and any critical path items.
  - 5. Provide legend for symbols and abbreviations used.
  - 6. Show critical path tasks; differentiate them from other construction tasks.
  - 7. Schedule will be based upon a five-day workweek.

### 3.2 REVIEW AND EVALUATION OF SCHEDULE

- A. Review and Approval of Initial Working Schedule: Within ten (10) calendar days after receipt of the initial arrow diagram and computer produced schedule, the University's representative shall meet with the contractor and for joint review, correction or adjustment of the proposed plan and schedule to evaluate the cost values assigned to each activity. Within ten (10) calendar days after the joint review, the Contractor will revise the arrow diagram and the computer- produced schedule in accordance with agreement reached during the joint review and shall submit two (2) copies each of the revised arrow diagram, computer produced schedule and cost requisition to the University. The resubmission will be reviewed by the University and, if found to be as previously agreed upon, will be approved. An approved

copy of each will be returned to the Contractor. The contractor shall review the schedule to insure that it reflects all changes agreed to and, if all changes have been made, the contractor shall approve and sign the network diagrams, computer produced schedule and cost requisition listing at that time. Approval will be without reservation and the contractor will be deemed to have accepted the schedule as adequate, proper and binding in all respects and shall not raise objections to the schedule. After the network diagrams, computer-produced schedule and cost requisition listing have been signed, the Contractor shall forward one (1) set of signed copies of all scheduling documents to the Owner's Project Manager. The arrow diagram and the computer-produced schedule with approved signatures shall constitute the project work schedule until subsequently revised in accordance with the requirements of this section.

- B. Evaluate project status to determine work behind schedule and work ahead of schedule. Submit revised recovery schedule with action plan to bring "behind schedule" tasks and milestones back into original timeline.

### 3.3 UPDATING SCHEDULES

- A. Maintain schedules to record actual start and finish dates of completed activities.
  - 1. Updated schedules must be submitted at each progress meeting and with each application for payment or as required by Architect or Owner. These schedules must include the following:
    - a. approved changes in activity sequencing;
    - b. changes in activity durations for unstarted or partially completed activities where agreed upon;
    - c. the effect to the network of any delays in any activities in progress and/or the impact of known delays, which are expected to affect future work;
    - d. the effect of contractor modifications; i.e., activity durations, logic and cost estimates; to the network;
    - e. changes to activity logic where agreed upon to reflect revision in the contractor's work plan; i.e., changes in activity duration, cost estimates and activity sequences for the purpose of regaining lost time or improving progress;
    - f. changes to milestones, and due dates (except substantial completion) which have been agreed upon by the University since the last revision of the schedule.
- B. At the same time the network is updated, the contractor and the University's representative shall jointly make entries on the preceding network diagram schedule to show actual progress, to identify those activities started by date and those completed by date during the previous period to show the estimated time required to complete each activity started but not yet completed, to show activity percent completed and to reflect any changes in the arrow diagram approved in accordance with the preceding paragraph. After completion of the joint review and the University's approval of all entries, the Contractor will submit updated network diagrams and an updated computer produced calendar dated schedule to the University and the contractor.
  - 1. The resultant computer print-out and network diagrams shall be recognized by the contractor as solely his/her updated construction schedule to complete all remaining contractor work except that portion affected by interim University decisions.

### 3.4 DISTRIBUTION OF SCHEDULES

- A. Upon approval at each level of schedule development (preliminary, final for Contractors work and Single Coordinated including all Prime Contractors work) the Contractor shall prepare and distribute (10) copies of the schedule at each level to the University. The Contractor shall also prepare and distribute two (2) copies of the final schedule showing Prime Contractors work to each Prime Contractor. In the event a new Prime Contractor is added to the job the General Construction Contractor shall furnish a revised schedule immediately with copies as indicated. The final coordinated schedule shall be signed and dated by all Prime Contractors involved and shall become part of the contract documents.
- B. Distribute copies of updated (current) schedules to Contractors project site file, subcontractors, suppliers, Architect and Owner at each bi-weekly progress meeting. Also submit an updated (current) schedule with each Application for Payment or more often as required by the Architect and/or Owner.

### 3.5 SCHEDULE ADJUSTMENTS

- A. Upon Owner and/or Architects request, if Contractor falls behind the approved schedule, the Contractor must submit a revised schedule to show how the Contractor intends to accomplish the completion of the work within the original contract time.
  - 1. Within seven (7) days after receipt of notice from the Owner, the contractor shall submit to the University in writing an explanation of corrective action taken or proposed. The contracting officer shall make a decision binding on all parties after reviewing the written submissions.
- B. Responsibility for Completion: The contractor agrees that whenever it becomes apparent from the current monthly computer produced calendar dated schedule that any contract completion date will not be met, he/she will take some or all of the following actions at no additional cost to the University.
  - 1. increase construction manpower in such trades and numbers as will substantially eliminate the backlog of work in the opinion of the Construction Manager and contracting officer
  - 2. increase the number of working hours per shift, shifts per working days, working days per week or the amount of construction equipment of any combination of the foregoing sufficiently to substantially eliminate the backlog of work in the judgment of the Construction Manager and contracting officer
  - 3. reschedule activities to achieve maximum practical concurrence of accomplishment of activities
- C. Lost time due to weather conditions will not accrue nor be credited to Contractor for weather delays with time added to the Substantial Completion milestone deadline. No weather delays will be granted once the building is under roof.

### 3.6 BI-WEEKLY REPORTING

- A. Upon request from the Owner, the Contractor shall furnish for approval, his proposed operating schedule for the next immediate two-week period of time. This schedule will be submitted at each bi-weekly progress meeting along with the overall updated schedule.
  - 1. Every two (2) weeks, the Architect will conduct a coordination and scheduling meeting on the job site. At this meeting, the contractor shall provide detailed information in the form of a bar chart schedule regarding the work schedule to be performed during the

- upcoming two (2) weeks. Bi-weekly scheduling by the contractor shall be in accordance with the priorities and degree of concurrent work required by the official schedule for the project. The contractor shall be prepared to explain a difference between the contractor's bi-weekly schedules and the priorities required by the latest updating of the official schedule.
2. At the bi-weekly scheduling meeting, the Owner and Architect shall review the bar charts for the preceding two (2) weeks and the contractor shall report the progress actually achieved for each activity, which was scheduled to be performed during the two (2) weeks, including the actual dates on which the work was performed. The contractor agrees that this information shall constitute the official historical record of project progress. At each bi-weekly scheduling meeting, the contractor shall document any current delays to work operations. In addition, the contractor shall provide any available information regarding any potential delays, which they anticipate; i.e., procurement delays, expected strikes, etc.
  3. Following the bi-weekly scheduling meeting, the Contractor shall issue to the Owner and Architect a new set of bi-weekly bar charts as developed at the meeting, which shall constitute the construction schedule for the upcoming two (2) weeks. The Contractor shall also issue a narrative bi-weekly progress analysis documenting progress achieved during the preceding two (2) weeks and analyze delays reported to constitute current or anticipated impacts to timely construction. The revised bar chart schedule and progress narrative shall agree with the meeting minutes and items discussed and agreed to at the bi-weekly meeting.
  4. The contractor shall be represented at the bi-weekly scheduling meeting by their Construction Manager who shall have complete authority to provide the information required for the development of the next two (2) weeks bar chart schedule, documentation of past progress and documentation of delays. The contractor representatives shall also be authorized to discuss correction action planned to overcome delaying conditions at these meetings.

### 3.7 DAILY REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at the Project site:
  1. List of subcontractors at Project site.
  2. List of separate contractors at Project site.
  3. Approximate count of personnel at Project site.
  4. Equipment at Project site.
  5. Material deliveries.
  6. High and low temperatures and general weather conditions.
  7. Accidents.
  8. Meetings and significant decisions.
  9. Unusual events (refer to special reports).
  10. Stoppages, delays, shortages, and losses.
  11. Meter readings and similar recordings.
  12. Emergency procedures.
  13. Orders and requests of authorities having jurisdiction.
  14. Change Orders received and implemented.
  15. Construction Change Directives received and implemented.
  16. Services connected and disconnected.
  17. Equipment or system tests and startups.
  18. Partial Completions and occupancies.
  19. Substantial Completions authorized.

- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents prepare and submit a detailed report. Submit with requests for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

END OF SECTION 013200

## SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

### 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 the following:
  - 1. Preconstruction photographs.
  - 2. Periodic construction photographs.
- B. Related Sections include the following:
  - 1. Division 1 Section "Selective Demolition" for photographic documentation before selective demolition operations commence.
  - 2. Division 1 Section "Closeout Procedures" for submitting digital media as Project Record Documents at Project closeout.

#### 1.3 UNIT PRICES

- A. Basis for Bids: Base number of construction photographs on four photographs per month over the duration of Project.

#### 1.4 INFORMATIONAL 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 information as corresponding photographic documentation.
- B. Construction Photographs: Submit two prints of each photographic view with monthly application for payment.
  - 1. Format: 8-by-10-inch (203-by-254-mm) laser jet paper
  - 2. Identification: On back of each print, provide the following information:
    - a. Name of Project.
    - b. Name of Architect.
    - c. Name of Contractor.
    - d. Date photograph was taken if not date stamped by camera.
    - e. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

3. Digital Images: Upload a complete set of digital image electronic files as a Project Record Document to the NK Architects' Newforma site. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped.

## 1.5 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.

## 1.6 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.
- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full high-definition mode with vibration-reduction technology. Provide supplemental lighting in low light levels or backlit conditions.
- C. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- D. Metadata: Record accurate date and time and GPS location data from camera.
- E. File Names: Name media files with date, Project area, and sequential numbering suffix.

## 1.7 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.
  2. Photographs shall show general progress throughout the project.
  3. Images should avoid human subjects to the greatest extent possible.
- 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 indexed digital images easily accessible 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 starting construction, take digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
1. Flag construction limits before taking construction photographs.
  2. Take minimum eight photographs to show existing conditions adjacent to property before starting the Work.
  3. Take minimum eight photographs of existing site to accurately record physical conditions at start of construction.
  4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
  5. Take additional photographs as required within the area of work to accurately record existing conditions prior to start of work.
- D. Periodic Construction Photographs: Take minimum 12 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013233

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## SECTION 013300 - SUBMITTAL 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 requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
  - 1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
  - 2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
  - 3. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  - 4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 5. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

#### 1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

#### 1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
  2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
  3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
    - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
  4. Format: Arrange the following information in a tabular format:
    - a. Scheduled date for first submittal.
    - b. Specification Section number and title.
    - c. Submittal category: Action; informational.
    - d. Name of subcontractor.
    - e. Description of the Work covered.
    - f. Scheduled date for Architect's final release or approval.
    - g. Scheduled date of fabrication.
    - h. Scheduled dates for purchasing.
    - i. Scheduled dates for installation.
    - j. Activity or event number.

#### 1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.
    - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    - b. This service is not available prior to the award of the contract.
    - c. Digital Drawing Software Program: The Contract Drawings are available in the current version of AutoCAD or Revit.
    - d. Drawings shall be forwarded only upon receipt of signed acceptance of terms form. Files will not be transmitted prior to executing above agreement. Acceptance forms are available from the Architect.
    - e. The following digital data files will be furnished for each appropriate discipline:
      - 1) Floor plans.
      - 2) Reflected ceiling plans.

2. These files will be issued for the convenience of the Contractor or trade and the Contractor or trade remains responsible for all contract requirements related to the normal shop drawing preparation process.
  3. CAD files may or may not contain differences from the Contract Documents, including work and information related, but not limited to, alternate designs, obsolete designs, addenda, bulletins, construction sketches, and informational sketches. Such differences may or may not be clearly indicated. Where such differences are found, they do not supersede the Contract Documents.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
    - a. Submittals received later than 1:00pm via ground delivery will be considered received the next business day.
    - b. Submittals received later than 3:00pm via electronic delivery will be considered received the next business day.
  2. Resubmittal Review: Allow 15 business days for review of each resubmittal.
  3. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 business days for initial review of each submittal.
  4. Concurrent Transmittal to Owner:
    - a. Transmit two (2) additional copies of all shop drawings, product data and coordination drawings and coordination drawings and one (1) set of each sample submittal to Owner's Project Manager.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
  - a. File name shall use project identifier and Specification Section number followed by a sequential number and revision number (e.g., AAA 30 061000 0001 00). Submittals shall be numbered sequentially after next open number in the sequence (e.g., AAA 30 061000 0002 00). The last two digits shall represent the submission number, 0 for initial, 1 for first resubmittal (e.g., AAA 30 061000 0001 01), etc....
  - b. For projects submitting through Newforma, submittal numbering shall be input beginning with the specification section number, and the program will automatically sequence under that number.
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner, containing the following information:
  - a. Project name.
  - b. Date.
  - c. Name and address of Architect.
  - d. Name of Construction Manager.
  - e. Name of Contractor.
  - f. Name of firm or entity that prepared submittal.
  - g. Names of subcontractor, manufacturer, and supplier.
  - h. Category and type of submittal.
  - i. Submittal purpose and description.
  - j. Specification Section number and title.
  - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
  - l. Drawing number and detail references, as appropriate.
  - m. Location(s) where product is to be installed, as appropriate.
  - n. Related physical samples submitted directly.
  - o. Indication of full or partial submittal.
  - p. Transmittal number, numbered consecutively.
  - q. Submittal and transmittal distribution record.
  - r. Other necessary identification.
  - s. Remarks.
  - t. Refer to sample checklist in Section 4 for additional items to be incorporated into the Form.
- E. Options: Identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
  1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision (example: revision clouds).

3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.
- J. Additional Copies: Contractor shall furnish all required hard copies for permits, delegated design submittals as may be required by the Authority Having Jurisdiction, or other entities as may be required.

## PART 2 - PRODUCTS

### 2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
  1. All submittals are to be sent to [shopdrawings@nkarchitects.com](mailto:shopdrawings@nkarchitects.com) and copied to the NKA project team.
    - a. For all submittals submitted through Trimble Unity Construct PMIS submit to above email address (Ball-In-Court) and copy the NKA project team. Contractor to coordinate the review stamp dispositions with their native software.
  2. Post electronic submittals as PDF electronic files directly to the University's Project Management Software System specificity establish for the Project. The University will supply a user account to the software and provide training.
    - a. Architect, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
  3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
- C. Submittals Schedule: Comply with General Conditions and other requirements of the Contract Administration Division. A submittal schedule will be developed by the Contractor within 10 working days of Notice to Proceed and approved by the Architect within 10 working days after receipt for review.

1. **Follow the submittal requirements listed in this Section and elsewhere throughout the Contract Documents however and in addition to submittals required in other specification sections, one (1) copy of all HVAC, sprinkler, plumbing, electrical, and control system submittal must be forwarded to the Owner's Project Manager. At minimum, for submittals other than those listed under this item a transmittal must be forwarded to the Owner's Project Manager.**
- D. Contractor shall record all submittal information on the required "Submittal Log". Distribute Log at each progress meeting.
- E. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams showing factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before or concurrent with Samples.
  6. Submit Product Data in the following format:
    - a. PDF electronic file.
- F. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
  1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.



2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
  3. Submit Shop Drawings in the following format:
    - a. PDF electronic file.
    - b. Drawings requiring review by the Structural Engineer shall be submitted as follows:
      - 1) Drawings on sheets up to 11 by 17 inches shall be submitted electronically.
      - 2) Drawings on sheets larger than 11 by 17 inches shall be submitted hard copy, two sets.
  4. BIM File Incorporation: Develop and incorporate Shop Drawing files into Building Information Model established for Project.
    - a. Prepare Shop Drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.
    - b. Refer to Section 013100 "Project Management and Coordination" for requirements for coordination drawings.
- G. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of applicable Specification Section.
    - e. Specification paragraph number and generic name of each item.
  3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
  4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
  - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record/control sample.
    - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
    - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- H. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
- I. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- J. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- K. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- L. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- M. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- N. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- O. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- P. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure

Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

- Q. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- R. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- S. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- T. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- U. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- V. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- W. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.
  - 5. Description of product.
  - 6. Test procedures and results.
  - 7. Limitations of use.
- X. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- Y. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- Z. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- AA. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads.

Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

## 2.2 SPECIAL TYPES OF SHOP DRAWINGS

- A. Sleeve and Opening Drawings: Comply with requirements set forth in the General Conditions.
  - 1. Comply with shop drawing requirements for submittal and review as specified in this Section.
- B. Roughing Drawings: Furnish manufacturers certified roughing drawings, indicating accurate locations and sizes of all service utility connections, for machinery and equipment requiring such connections. Submit roughing drawings together with shop drawings for respective machinery and equipment

## 2.3 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
- C. BIM File Incorporation: Incorporate delegated-design drawing and data files into Building Information Model established for Project.
  - 1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as the original Drawings.
- D. All delegated design submittals will be reviewed by the Architect.
  - 1. Delegated design submittals required to be submitted to DCA/AHJ shall first be reviewed by the Architect. Upon successful completion of review, the Architect shall return the submittal to the Contractor who will then submit to the Code Official for review.
  - 2. The following submittals require review by the Authority Having Jurisdiction:
    - a. Section 055000 – Metal Fabrications
    - b. Section 210000 – Fire Protection.
    - c. Section 280000 – Fire Alarm System.

3. Submittal shall be complete, including (but not limited to) product data, submittals, shop drawings and details. Incomplete submittals will be rejected and returned without review.
  - a. Contractor shall also provide coordinated flashing details due to overlapping trade work with the masonry and cast stone work. Details shall be submitted well in advance of Work.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### 3.2 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action. action, as follows:
  1. "NO EXCEPTIONS TAKEN": If the drawings are in full compliance with all Contract Documents or if the indicated deviations are acceptable.
  2. "MAKE CORRECTIONS NOTED": If drawings have corrections which must be made. Subsequently one of the following actions shall be taken by the Contractor:
    - a. "FAB. & CONST. MAY PROCEED": If corrections are minor and not significant enough to require resubmission. Noted corrections must be made in the final installation.
    - b. "REVISE AND RESUBMIT": If resubmission is required due to the nature or number of corrections.
  3. "REJECTED": If shop drawings do not meet contract requirements. Resubmission of shop drawings which meet contract requirements are required.
  4. "REVIEWED": For items submitted for record only, or delegated design submittals that are provided with the Contractors' Engineer signature and seal.
- B. Work shall be executed in accordance with "No Exception Taken" or "Make Corrections Noted, Fabrication & Construction May Proceed" drawings only.
- C. Architects' review of shop drawings will constitute checking for general arrangement only, and shall not relieve the Contractor of responsibility for complete compliance with Drawings and

Specifications. Contractor shall be responsible for quantities and dimensions to assure a proper fit under field conditions.

- D. Review of submittals and calculations bearing the seal of a professional engineer will be reviewed for design intent and check for conformance with design criteria only.
- E. Submittals marked "No Exceptions Taken" or "Make Corrections Noted – Fabrication and Construction May Proceed" in conjunction with "Revise and Resubmit" are acceptable for fabrication and construction, but a resubmittal is required for record purposes only.
- F. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- G. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- H. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- I. Submittals not required by the Contract Documents may be returned by the Architect without action.

### 3.3 COLOR SELECTIONS

- A. All colors for all finished surfaces and materials will be selected or approved by Architect. The colour selections will be made at one time to provide a complete and coordinated colour schedule which, upon acceptance of the Owner, will be provided to the Contractor.
- B. It is imperative that all colour information be submitted to the Architect by the Contractor before colour selections can be made. If any colour selection information is not available when colors are needed to meet the project schedule, the Architect will select colors from one of the named manufacturers in the Specifications, and the Contractor will be required to exactly match that colour. A claim for delay will not be accepted if the colour schedule is late due to the failure of the Contractor to provide the Architect with all required colour information, nor will an extra be entertained if the selected colour is not available from the Manufacturer the Contractor intended to use but neglected to submit.

## PART 4 - SAMPLE CHECKLIST

### 4.1 SUMMARY

- A. Information below is sample material only. Refer to Section 1.5 "SUBMITTAL ADMINISTRATIVE REQUIREMENTS" for additional requirements.

#### INFORMATION AND CHECKLIST

1. Direct contact information for product representative or supplier to which questions can be referred (name, address, phone number and email address).
2. Are all specified or scheduled items included and exactly match scheduled/specified items? Yes No 

Comment
3. Is this item a substitution? Yes No
4. Are deviations clearly identified? Yes No
5. Does item fit space shown on construction documents, coordination drawings, and actual field conditions? Yes No
6. Does this material/equipment add expense to other trades or project costs? Yes No
7. Is control interface coordinated? Yes No
8. List electrical characteristics (V/Ph/Hz/A).

END OF SECTION 013300

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## SECTION 013546 – INDOOR AIR QUALITY MANAGEMENT

### PART 1 - GENERAL

#### 1.1 CONSTRUCTION IAQ MANAGEMENT GOALS FOR THIS PROJECT

- A. This Project shall minimize the detrimental impacts on Indoor Air Quality (IAQ) resulting from construction activities. Factors that contaminate indoor air, such as dust entering HVAC systems and ductwork, improper storage of materials in-site, poor housekeeping, shall be minimized.

#### 1.2 SUMMARY

- A. This section includes:
  - 1. Product requirements for indoor construction and finishing materials.
  - 2. Final Construction Products List
  - 3. Construction site management.
  - 4. Indoor Environmental Consultant qualifications
  - 5. Scheduling and product installation sequencing.
  - 6. Operation of HVAC systems during construction.
  - 7. Product installation.
  - 8. Building flush out.
  - 9. Indoor air quality testing.
  - 10. Documentation and reporting.

#### 1.3 REFERENCES

- A. American Conference of Government Industrial Hygienists (ACGIH).
- B. American National Standards Institute/American Society of Heating, Refrigeration, and Air Conditioning Engineers (ANSI/ASHRAE):
  - 1. 52.2 – Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
  - 2. 55 – Thermal Environmental Conditions for Human Occupancy
  - 3. 62.1 – Ventilation for Acceptable Indoor Air Quality
  - 4. 62.2 – Ventilation and Acceptable Indoor Air Quality for Low-Rise Residential Buildings
- C. GREENGUARD Environmental Institute (GREENGUARD) - Indoor Air Quality Certification Program.
- D. U.S. Green Building Council (USGBC) - Leadership in Energy and Environmental Design (LEED) 2009 for New Construction and Major Renovations
- E. U.S. Green Building Council (USGBC) - Leadership in Energy and Environmental Design (LEED) 2009 for Commercial Interiors.
- F. Sheet Metal and Air Conditioning Manufacturer's Association International (SMACNA)

G. United States Environmental Protection Agency (EPA):

1. Compendium of Methods for the Determination of Air Pollutants in Indoor Air.
2. National Ambient Air Quality Standard, Code of Federal Regulations, Title 40, Part 50.

1.4 DEFINITIONS

- A. Dry Products: Products used in a solid state, including gypsum board, carpet, acoustical panels and tiles, and textiles.
- B. MERV: Minimum Efficiency Reporting Value.
- C. Priority Products: Products known to be high chemical emitters, long term emitters, and those expected to present emissions in high amounts (high surface area).
- D. Threshold Limit Value (TLV): Industrial Work Place Standard as defined by ACGIH.
- E. Wet Products: Products used in a liquid or semi-liquid state, including adhesives, joint sealers, paints, and coatings.

1.5 REFERENCES, RESOURCES

- A. SMACNA IAQ Guidelines for Occupied Buildings Under Construction, First edition, November 1995, The Sheet Metal and Air Conditioner National Contractors Association. (703) 803-2980, [www.ashrae.org](http://www.ashrae.org).
- B. ANSI/ASHRAE 52.2-1999, "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size", [www.ashrae.org](http://www.ashrae.org).

1.6 SUBMITTAL REQUIREMENTS

A. Final Construction Products List:

1. Submit list of proposed indoor construction and finishing products.
2. Include strategies for minimizing use of wet products.
3. Obtain approval by **Architect** prior to installation of products.

B. Indoor Air Quality Test Report:

1. Provide copies of Indoor Air Quality Test Report from Indoor Environmental Consultant.
2. Include in report:
  - a. Study design including methodology for determination of air sampling locations and duration of sampling.
  - b. Summary of sampling and analytical methods employed.
  - c. Copy of field sampling logs.
  - d. Summary of methods and results used to determine that ventilation system was started at normal daily start time and operated at minimum outside airflow rates for occupied mode for duration of air testing.

- e. Laboratory analytical data for each contaminant and summary table showing compliance with specified criteria.

## 1.7 QUALITY ASSURANCE

- A. Provide written notification of product requirements to subcontractors and suppliers of interior construction and finishing products.
- B. Indoor Environmental Consultant Qualifications:
  - 1. **Contractor shall** employ and pay for an Indoor Environmental Consultant to perform specified indoor air quality testing.
  - 2. Minimum 5 years experience in conducting indoor environmental quality evaluations of non-industrial buildings.
  - 3. Retain Certified Industrial Hygienist (CIH) on staff to review and sign test reports.

## 1.8 DELIVERY, STORAGE AND HANDLING

- A. Storage Area:
  - 1. Designate secure storage area to facilitate protection of stored absorptive products.
  - 2. Clearly identify storage area. Keep dry, clean, and orderly; prevent contamination of products.
  - 3. Monitor storage areas for contamination; correct problems and implement preventative measures.
- B. Products:
  - 1. Protect absorptive products from moisture damage before, during, and after installation.
  - 2. Immediately remove products exhibiting stains, mold, mildew, or other evidence of water or moisture damage from site.

## PART 2 - PRODUCTS

### 2.1 FILTRATION MEDIA

- A. If air handlers are used during construction, filtration media must be used at each return grille and have a Minimum Efficiency Reporting Value (MERV) of at least 8, as determined by ASHRAE 52.2.
- B. All filtration media shall be replaced immediately prior to occupancy and must have a MERV of 13, as determined by ASHRAE 52-2.

### 2.2 GENERAL

- A. Interior Construction and Finishing Products; in purchasing products, give preference to:
  - 1. Products designed and manufactured in manner to produce least harmful and irritating effects.

2. Products certified by GREENGUARD Environmental Institute as Low Emitting. For products that are not GREENGUARD Certified, provide a test, which at maximum is performed one year prior to installation, to ensure conformance to GREENGUARD standard emission values.
3. Products providing lowest practical yet technologically achievable emissions of particulates and chemical vapors, as defined in following paragraphs.

B. Maximum Chemical emission Values for Products In Commercial or Retail Buildings:

1. Emission rate calculations: Assume 32 cubic meters as volume for determination of product loading.
2. Product emission rates and modeling for predicted exposure concentrations: As measured in milligrams/square meter per hour ( $\text{mg}/\text{m}^2 \times \text{hr}$ ) at anticipated loading (square meter/cubic meter [ $\text{m}^2/\text{m}^3$ ] within building. Predicted indoor concentrations shall be based on building modeling parameters of 0.72 air changes per hour (ACH). The product shall produce indoor air concentration levels less than the amounts specified for each substance within seven (7) days of installation.
3. Total VOC emission rate: Maximum total volatile organic compounds (VOC) of 0.05 milligrams/cubic meter ( $\text{mg}/\text{m}^3$ ).
4. Total aldehydes: Maximum 0.1 parts per million (ppm).
5. Formaldehyde: Maximum 0.05 parts per million (ppm).
6. 4-Phenylcyclohexene (4-PC): Maximum 0.0065 milligrams/cubic meter ( $\text{mg}/\text{m}^3$ ) or 0.1 parts per billion (ppb).
7. Styrene: Maximum 0.07 milligrams/cubic meter ( $\text{mg}/\text{m}^3$ ).
8. For individual Volatile Organic Compounds (VOCs) not listed above: Shall produce an air concentration level less than 1/10th of the Threshold Limit Value (TLV) at the anticipated product loading in the building within seven (7) days of installation.
9. Regulated pollutants: Maximum air concentration as promulgated by National Ambient Air Quality Standard for primary and secondary outdoor air pollutants.
10. Identified carcinogens and reproductive toxins: Below levels of no significant risk according to evaluation protocols established by EPA or approved State and public health organizations.

C. Maximum Chemical and Particle emission Values for Products In Educational, Daycare, Healthcare, or Otherwise Sensitive Environments:

1. Emission rate calculations: Assume 231 cubic meters as volume for determination of product loading.
2. Product emission rates and modeling for predicted exposure concentrations: As measured in milligrams/square meter per hour ( $\text{mg}/\text{m}^2 \times \text{hr}$ ) at anticipated loading (square meter/cubic meter [ $\text{m}^2/\text{m}^3$ ] within building. Predicted indoor concentrations shall be based on building modeling parameters of 0.9 air changes per hour (ACH) and a 0.9 ventilated volume fraction. The product shall produce indoor air concentration levels less than the amounts specified for each substance within seven (7) days of installation except for formaldehyde. Formaldehyde criteria are established so that emission levels reach 0.014 ppm (13.5 ppb) within 14 days of installation (meeting CA 1350 requirements).
3. Total VOC emission rate: Maximum total volatile organic compounds (VOC) of 0.022 milligrams/cubic meter ( $\text{mg}/\text{m}^3$ ).
4. Total aldehydes: Maximum 0.043 parts per million (ppm).
5. Formaldehyde: Maximum 0.0135 parts per million (ppm) within 14 days of installation.
6. Total Phthalates: Maximum 0.01 milligrams/cubic meter ( $\text{mg}/\text{m}^3$ ). Total phthalates are defined as the total response of a specific target list of phthalates including dibutyl (DBP), diethylhexyl (DEHD), diethyl (DEP), butylbenzyl(BBP), di-octyl (DOP), and dimethyl (DMP) phthalates (conducted using a modified phthalate specific analytical method, OSHA 104).

7. Total Particles: Maximum 0.02 milligrams/cubic meter ( $\text{mg}^2/\text{m}^3$ ). This is applicable only to fibrous, particle-releasing products with exposed surface area in air streams (determined using a "forced air" test with specific test method).
8. For individual Volatile Organic Compounds (VOCs) not listed above: Shall produce an air concentration level less than 1/100 of the Threshold Limit Value (TLV) and less than 1/2 of the California Chronic REL at the anticipated product loading in the building within seven (7) days of installation.

## PART 3 - EXECUTION

### 3.1 CONSTRUCTION IAQ MANAGEMENT PLAN – DETAILED REQUIREMENTS

- A. SMACNA Guidelines, as stated in Chapter 3 of the referenced "IAQ Guidelines for Occupied Buildings Under Construction", outline IAQ measures in five categories as listed below. The Construction IAQ Management Plan shall be organized in accordance with the SMACNA format, and shall address measures to be implemented by the Contractor and/or Subcontractors in each of the five categories (including subsections). All subsections shall be listed in the Plan; items that are not applicable for this project should be listed as such.
  1. HVAC Protection: Shall include Return Side, Central Filtration, Supply Side and Duct Cleaning:
    - a. Contractor shall direct subcontractors to protect air handling and distribution equipment, and air supply and return ducting during construction. The designated Indoor Air Quality Manager shall inspect work and monitor subcontractor(s) to insure compliance.
    - b. All ductwork arriving on site shall be sealed with plastic sheeting and stored on pallets or dunnage until installed.
    - c. Contractor shall direct subcontractors to cover and protect all exposed air inlets and outlets, openings, grilles, ducts, plenums, etc. to prevent water, moisture, dust and other contaminate intrusion.
    - d. Contractor shall direct subcontractors to apply protection immediately after installation of ductwork.
    - e. Ducting runs shall be protected at the end of the days' work.
    - f. Contractor shall direct subcontractor to inspect temporary filtration weekly and replace as required to maintain the proper ventilation rates in the building.
  2. Source Control:
    - a. Contractor shall direct subcontractors to protect stored on-site or installed absorptive or porous materials, insulations, batts, ceiling tiles, carpet, wall paneling and textiles.
    - b. Contractor shall not allow subcontractors to use wet and/or damaged porous materials in the building.

- c. Contractor shall require subcontractors to use low emitting paints, sealants, adhesives and carpet.
  - d. Contractor shall inform subcontractors that no interior grade composite wood materials (plywood, MDF, particleboard, OSB, chipboard, etc.) or agri-panels (wheatboard, strawboard or other panels made from agricultural waste materials) containing urea-formaldehyde bonding agents will be permitted on the project.
  - e. Product Substitution.
  - f. Modifying Equipment Operation.
  - g. Changing Work Practice.
  - h. Local Exhaust.
  - i. Air Cleaning.
  - j. Cover or Seal.
- 3. Pathway Interruption:
  - a. Depressurize Work Area.
  - b. Pressurize Occupied Space.
  - c. Erect Barriers to Contain Construction Areas.
  - d. Relocate Pollutant Sources.
  - e. Temporarily Seal the Building.
- 4. Housekeeping.
- 5. Scheduling.
- B. Protection of Materials from Moisture Damage: As part of the Housekeeping section of the Construction IAQ Management Plan, measures to prevent installed materials or material stored on-site from moisture damage shall be described. This section should also describe measures to be taken if moisture damage does occur to absorptive materials during the course of construction.
- C. Replacement of Filtration Media: Under the HVAC Protection section of the Construction IAQ Management Plan, a description of the filtration media in all ventilation equipment shall be provided. The description shall include replacement criteria for filtration media during construction, and confirmation of filtration media replacement for all equipment immediately prior to occupancy. Filtration media shall meet the requirements of this specification.
- D. Sequence of Finish Installation for Materials:
  - 1. Absorptive materials (referred to herein as Type 2 finishes) shall be installed after the installation of materials of finishes which have high short-term emissions of VOCs, formaldehyde, particulates, or other air-borne compounds (referred to herein as Type 1 finishes). Absorptive materials include, but are not limited to: carpets; acoustical ceiling

panels; fabric wall coverings; insulations (exposed to the air stream); upholstered furnishings; and other woven, fibrous or porous materials. Materials with high short-term emissions include, but are not limited to: adhesives, sealants and glazing compounds (specifically those with petrochemical vehicles or carriers); paints; wood preservatives and finishes; control and/or expansion joint fillers; hard finishes requiring adhesive installation; gypsum board (with associated finish processes and products); and composite or engineered wood products with formaldehyde binders.

2. The contractor shall develop a sequencing schedule that identifies how the sequencing will occur for the project. The schedule shall be submitted to the Owner and Architect in accordance with the Submittal Requirements of this Section.
- E. Ventilation during installation of materials and finishes: 100% outside air shall be provided during the installation of materials and finishes, beginning after the building is substantially enclosed. If building HVAC systems are used to supply the ventilation air, filtration media shall be installed per the requirements of Filtration Media of this specification.

### 3.2 BUILDING FLUSH OUT

- A. If building meets Clearance Criteria immediately following construction, building flush-out is not required.
- B. Following completion of interior finishes and installation of new furnishings, flush building with 100 percent clean outdoor air for two to four weeks prior to occupancy. If time does not permit a two to four week flush-out period, the design and construction team shall designate whatever time is available for building flush (even if it is as minimal as 24 hours).
- C. Install new MERV 13 filtration media prior to beginning the flush-out procedure.
- D. After flush-out, install new MERV 13 filtration media, except for those filters processing only outdoor air.

### 3.3 INDOOR AIR QUALITY TESTING

- A. Perform testing after completion of construction and installation of new furnishings, but before Owner occupancy, using protocols established by reputable standard setting or method development organizations such as state and federal agencies and reputable nongovernmental organizations such as the GREENGUARD Environmental Institute or ASTM.
- B. Conduct testing prior to Owner occupancy but during normally occupied hours.
- C. Operate building HVAC system at normal daily start and stop times at minimum outside airflow for occupied mode for duration of testing.
- D. Number of Air Sampling Locations: Minimum of one per 25,000 square feet or for each contiguous floor area, whichever is greater. Include areas with least ventilation and greatest presumed source strength.
- E. At each location, collect samples at to 6 feet above floor over minimum 4 hour period.
- F. Demonstrate that contaminant concentrations do not exceed following maximum concentration limits:

<u>Contaminant</u>	<u>Maximum Concentration Limit</u>
Carbon Dioxide *	10,300/ventilation rate
Carbon Monoxide	9 ppm and maximum 2 ppm above outdoor levels
Total Volatile Organic Compounds	Maximum 500 micrograms/ cubic meter
Formaldehyde	Maximum 27 parts per billion
4-Phenylcyclohexene	(4-PCH) Maximum 6.5 micrograms/cubic meter
Other Individual VOC's	Below odor and/or sensory irritation threshold and maximum 1/10 TLV
Total Aldehydes	Maximum 100 parts per billion
Total Particles (PM 10)	Maximum 50 micrograms/cubic meter

\* Carbon dioxide monitoring is required only if building is occupied during testing. Ventilation rate is outdoor air requirement per person. Carbon dioxide measurement is differential between indoor and outdoor conditions, based on occupancy type as defined by ANSI/ASHRAE 62.1 and 62.2.

- G. For each sampling location where maximum concentration limit is exceeded, conduct additional flush-out with outside air and retest specific contaminant until maximum concentration limit is achieved. Collect samples for retesting from original sampling location.

END OF SECTION 013546



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## SECTION 014000 - QUALITY CONTROL REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, general conduct of the Work and Special Requirements, Supplementary Conditions, and other Division 01 Specification Sections, apply to this Section. In the event of any conflicts between the requirements of these Sections, the more stringent requirement shall apply.
  - 1. In Divisions 01 through 48 Sections:
    - a. The term "Architect" shall be synonymous with the term "Professional".
    - b. The terms "Subcontractor", "Sub-subcontractor", "Installer", "Applicator", "Erector" and similar terms are synonymous with the term "Trade Contractor".

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality-control services.
- B. Quality-control services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Architect.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
- D. Requirements of this Section relate to fabrication and installation procedures.
  - 1. Specific quality-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 inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- E. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 01 Section "Coordination".
  - 2. Division 01 Section "Testing and Inspections".
  - 3. Division 01 Section "Testing Laboratory Services".
  - 4. Testing by the Contractor of installed materials and equipment is specified in the Technical Sections (Divisions 02 through 48) of these Specifications.
- F. Testing requirements for real property installed equipment (RPIE) to be furnished by the contractor when such testing is required by code, contract or the manufacturer shall be performed in a pre-approved testing laboratory or in the absence of such by the manufacturer or its authorized representative at its place of business. The contractor shall

provide a five (5) days' notice to the University and Architect/Engineer through the Owner's Project Manager. The University and the Architect/Engineer shall have the right to witness all tests.

- G. The contractor will hire and pay for a qualified testing agency.

### 1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.
- D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

### 1.4 RESPONSIBILITIES

- A. **Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity. Contractor shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and/or required by authorities having jurisdiction. Costs for these services are included in the Contract Sum.**
1. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are to be done these services will be the Contractor's responsibility. The Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are included in the Contract Sum.
- B. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.
1. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements. The contractor shall pay for all costs including administrative cost incurred by the University.
2. When the University and/or Architect/Engineer require special or additional inspections, testing or approvals due to Contractor's failure to comply with contract specifications, industry standards, good building practices, any applicable code procedures including but not limited to ASIC, ASTM, etc., whether or not testing is required by the contract documents for any individual component, entire system or process, the Contractor will secure the service of such special or additional

inspections, testing or approvals. In the event such special or additional inspections and testing reveal a failure of the work to comply with the terms and conditions of the contract, the contractor shall also bear all costs necessary to repair or replace the work as required by the Architect/Engineer.

- C. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
1. Provide access to the Work.
  2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
  3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
  4. Provide facilities for storage and curing of test samples.
  5. Deliver samples to testing laboratories.
  6. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
  7. Provide security and protection of samples and test equipment at the Project Site.
- D. Duties of the Testing Agency: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect, the Contractor and the Owner in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.
1. The agency shall notify the Architect, the Contractor, and the Owner promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
  3. The agency shall not perform any duties of the Contractor.
- E. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

## 1.5 SUBMITTALS

- A. Submit a certified written report of each inspection, test, or similar service.
1. Distribute copies of each report to Owner, Architect and Engineer. Distribution of reports shall be made promptly, upon the completion of each test or inspection. **A field report will be distributed to the Owner's Project Manager prior to the Inspector leaving the jobsite on any day during which a test or inspection has been done. A final inspection report will be required from the inspection agency to all parties within five (5) business days following the inspection. Test reports will be required within (5) business days following the actual test date.**
  2. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
  3. Report Data: Refer to specification sections of Divisions 02 through 48 for submittal requirements applicable to inspection and test reports. In general, each report shall include:

- a. Date of issue.
- b. Project title and number.
- c. Name, address, and telephone number of testing agency.
- d. Dates and locations of samples and tests or inspections.
- e. Names of individuals making the inspection or test.
- f. Designation of the Work and test method.
- g. Identification of product and Specification Section.
- h. Complete inspection or test data.
- i. Test results and an interpretation of test results.
- j. Ambient conditions at the time of sample taking and testing.
- k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
- l. Name and signature of laboratory inspector.
- m. Recommendations on retesting.

4. All submittals of inspections and test reports or requests for approval shall be accompanied by a certification signed by the contractor attesting to his/her knowledge of the submittal, acceptance of its findings and acknowledgement that material tested meets the required standards and certify the report's representation of the facts. Failure to provide the written certification shall be grounds for rejection of the submittal.

## 1.6 QUALITY ASSURANCE

- A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.
  1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.
  2. Each independent inspection and testing agency engaged on the Project shall be pre-qualified by the Division of Building and Construction of the State of New Jersey to perform the types of tests and inspections required.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.1 REPAIRS AND PROTECTION

- A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes.
  1. Comply with Contract Document requirements for Division 01 Section "Cutting and Patching."
  2. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
  3. Restore patched areas and extended restoration into adjoining areas in a manner that eliminates evidence of patching.
- B. Protect construction exposed by or for quality control service activities, and protect repaired construction.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 014000

## SECTION 014100 - TESTING LABORATORY SERVICES

### PART 1 - GENERAL

#### 1.1 RELEATED DOCUMENTS

- A. Drawings and general provisions of the contract, including general conditions, general conduct of the work and special requirements, supplementary conditions, and other Division 01 specification sections, apply to this section. In the event of any conflicts between the requirements of these sections, the more stringent requirement shall apply.

#### 1.2 SECTION INCLUDES

- A. Selection and payment.
- B. Contractor submittals.
- C. Laboratory responsibilities.
- D. Laboratory reports.
- E. Limits on testing laboratory authority.
- F. Contractor responsibilities.

#### 1.3 RELATED SECTIONS

- A. General Conditions: Inspections, testing, and approvals required by public authorities.
- B. Individual Specification Sections: Inspections and tests required, and standards for testing.
- C. Drawings and general provisions of the Contract, including General Conditions, General Conduct of the Work and Special Requirements, Supplementary Conditions, and other Division 01 Specification Sections, apply to this Section. In the event of any conflicts between the requirements of these sections, the more stringent requirement shall apply.

#### 1.4 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM): ASTM C802 - Practice for Conducting an Interlaboratory Test Program to Determine the Precision of Test Methods for Construction.
- B. ASTM C1077 - Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- C. ASTM D290 - Recommended Practice for Bituminous Mixing Plant Inspection.
- D. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

- E. ASTM D4561 - Practice for Quality Control Systems or an Inspection and Testing Agency for Bituminous Paving Materials.
- F. ASTM E329 - Practice for Use in the Evaluation of Inspection and Testing Agencies as Used in Construction.
- G. ASTM E548 - Practice for Preparation of Criteria for Use in the Evaluation of Testing Laboratories and Inspection Bodies.
- H. Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee E6.

#### 1.5 SELECTION AND PAYMENT

- A. Contractor shall employ and pay for services of an independent Testing Laboratory, and Balancing Laboratory/Organization, approved by Owner and Architect/Engineer, to perform all specified inspecting and testing.
- B. Employment of testing laboratory in NO WAY relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

#### 1.6 QUALITY ASSURANCE

- A. Comply with requirements of ASTM C802, ASTM C1077, ASTM D290, ASTM D3740, ASTM D4561, ASTM E329, ASTM E548, and ASTM E699.
- B. Testing Laboratory Qualifications: Shall have been inspected by a nationally recognized inspection agency, acceptable to Owner and Architect/Engineer. Evidence of such inspection and current status shall be provided to Owner and Architect/Engineer. In addition, the approved lab shall document participation in a nationally recognized soils and concrete reference testing program during the twelve (12) months preceding the start of work on this project. Results of reference testing shall indicate an acceptable rating for the laboratory to be considered by the Owner and Architect/Engineer.
- C. Laboratory: Authorized to operate in the State in which Project is located.
- D. Laboratory Staff: Maintain a full time registered Professional Engineer on staff to review services.
- E. Testing Equipment: Shall be calibrated at reasonable intervals with devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

#### 1.7 CONTRACTOR SUBMITTALS

- A. PRIOR TO START OF WORK, submit testing laboratory name, address, and telephone number, and names of full time registered Engineer and responsible officer.
- B. Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.



## 1.8 LABORATORY RESPONSIBILITIES

- A. Test samples of required items submitted by Contractor.
- B. Provide qualified personnel at site. Cooperate with Architect/Engineer and Contractor in performance of services.
- C. Perform specified inspecting, sampling, and testing of Products in accordance with specified standards.
- D. Ascertain compliance of materials and mixes with requirements of Contract Documents.
- E. Promptly notify Architect/Engineer and Contractor of observed irregularities or non-conformance of Work or Products.
- F. Perform additional inspection and tests required by Architect/Engineer.

## 1.9 LABORATORY REPORTS

- A. After each inspection and test within five (5) business days, promptly submit three (3) copies of laboratory report to Owner, Architect/ Engineer, and to Contractor. Include:
  - 1. Date issued
  - 2. Project title and number
  - 3. Name of inspector
  - 4. Date and time of sampling or inspection
  - 5. Identification of product and specifications section
  - 6. Location in the Project
  - 7. Type of inspection or test
  - 8. Date of test
  - 9. Results of tests
  - 10. Conformance with Contract Documents.
- B. When requested by Architect/Engineer, provide interpretation of test results.

## 1.10 LIMITS ON TESTING LABORATORY AUTHORITY

- A. Laboratory MAY NOT release, revoke, alter, or enlarge on requirements of Contract Documents.
- B. Laboratory MAY NOT approve or accept any portion of the Work.
- C. Laboratory MAY NOT assume any duties of Contractor.
- D. Laboratory HAS NO authority to stop the Work.

## 1.11 CONTRACTOR RESPONSIBILITIES

- A. Deliver to laboratory at designated location, adequate samples of materials proposed to be used, which require testing.

- B. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
- C. Provide incidental labor and facilities:
  - 1. to provide access to Work to be tested,
  - 2. to obtain and handle samples at the site or at source of Products to be tested,
  - 3. to facilitate tests and inspections,
  - 4. to provide storage and curing of test samples.
- D. Notify Architect/Engineer, Owner and laboratory 24 hours prior to expected time for operations requiring inspecting and testing services.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 014100

## SECTION 014200- REFERENCE STANDARDS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, General Conduct of the Work and Special Requirements, Supplementary Conditions, and other Division 01 Specification Sections, apply to this Section. In the event of any conflicts between the requirements of these Sections, the more stringent requirement shall apply. In the event of any conflicts between the requirements of these Sections, the more stringent requirement shall apply.

#### 1.2 DEFINITIONS

- A. General: Basic contract definitions are included in the Conditions of the Contract.
- B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings; or to other paragraphs or schedules in the Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference. Location is not limited.
- C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Architect, requested by the Architect, and similar phrases, unless any item associated with these terms will result in a monetary change order to the project. If the items associated with these terms require a change order the Owner must be notified prior to any action being taken.
- D. "Approved": The term "approved," when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, and the Architect's and Owners duties and responsibilities are limited as specified by the Conditions of the Contract.
- E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conversations and agreements within the construction industry that control performance of the Work.
- F. "Furnish": The term "furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": The term "install" describes operations at the Project site including the actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

- I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.
  - 1. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
  - 2. Trades: 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 tradespersons of the corresponding generic name. However, work resulting from any construction activity performed by a "Trade" must meet all quality standards acceptable to the Architect and Owner
- J. "Project site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.
- K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.
- L. If Requested: If requested by the Owner.
- M. Where: Where or when practicable in the judgment of the Owner.
- N. Satisfactory: Acceptable in the judgment of the Owner.
- O. As Required: As required by the Architect, or as field conditions dictate.
- P. Replace: To remove an existing product or service, and furnish and install an indicated product in its place.
- Q. Specifications: The total and complete specifications of this Project as identified by the Architect, and the Architects consultants through the Architect, including referenced standard specifications, the General Specifications and the Technical Specifications as indexed.
- R. System/ Assembly: In the context of this Project, where a 'system' or an 'assembly' as indicated in the Specifications and/or Drawings, it shall consist of the sum of all the relevant parts and/or materials specific to the use of the system or assembly indicated; installed complete, in place, and in working order. All said parts and/or materials required for a complete system indicated, shall be supplied and installed as part of the Base Bid Price for a complete, proper, and fully functional installation, whether specifically detailed or not. All materials for the system or assembly shall be installed completely, all necessary connections to other construction shall be provided. Upon completion of this system or assembly, the sum of all the parts that constitute the make-up of this unit, shall function and/or operate properly according to its intended design.

- S. Mandatory: Means as required by code, any Building Authority, and any and all governing laws. All mandatory requirements for construction shall be included in the Base Bid Price for the Project.
- T. Functional: Items(s) installed that are to operate properly or as intended.
- U. Typical: A condition, detail, or other item that is common to an identified system, assembly, or any other construction condition where the essential characteristics are the same.

### 1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. Specification Format: These Specifications are organized into Divisions and Sections based on the 48-division format and CSI/ICSC's "MasterFormat" numbering system.
- B. Specification Content: These 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.
  - 1. 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 interpolated, as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
    - a. The Technical Specifications are of the abbreviated type and include incomplete sentences. Omissions of words or phrases such as "the Contractor shall"; "in conformance with"; "shall be"; "as noted on the Drawings"; "according to the Plans"; "a" "an"; "the"; and "all" are intentional. Omitted words and phrases shall be supplied by inference in the same manner, as they are when a "note" occurs on the Drawings. Works "shall be" "shall have", and "shall" will be supplied by inference where a colon (:) is used within sentences or phrases.
  - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Section Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the 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.
    - b. Abbreviated references to trade associations, technical societies, recognized authorities and other institutions are included in the contract documents. Any abbreviation or organization not recognized by the Contractors shall be requested from the Architect for interpretation. Failure to request and receive an interpretation shall not relieve the Contractor from performing and/or supplying materials or workmanship in compliance with specified references to the satisfaction of the Architect or Owner
- C. References: References to known standard specifications shall mean and intend the latest edition of such specifications adopted and published as of the date of the invitation to bid.
- D. Divisions: Divisions of the specifications into sections is done for the convenience of reference and is not intended to control the Contractor in dividing the Work among subcontractors or to limit the scope of work performed by any trade under any section

#### 1.4 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of the date of the Contract Documents.
- C. Conflicting Requirements: Where 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 the Architect for a decision before proceeding.
  - 1. 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 the requirements. Refer uncertainties to the Architect for a decision before proceeding
- D. Copies of Standards: Each entity engaged in construction on the Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - 1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.
- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-producing organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries.

#### 1.5 GOVERNING REGULATIONS AND AUTHORITIES

- A. Copies of Regulations: Obtain copies of the following regulations and retain at the Project site to be available for reference by parties who have a reasonable need:
  - 1. Any and all Federal, State or Local regulations required by the Agency having jurisdiction to be retained or posted at the project site

#### 1.6 SUBMITTALS

- A. Permits, Licenses, and Certificates: For the 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.

## 1.7 DRAWINGS

- A. The Contractor shall provide all quantities, items, articles, materials, operations, or methods listed, mentioned, implied, scheduled, or specified, on the Drawings, including all labor, materials, equipment, and incidentals required for their completion.
- B. Intent of the Drawings:
  - 1. As with any plan, the Contractor shall be responsible for verifying all field conditions, whether or not noted in the plans prior to construction. Any discrepancies shall be resolved with the Owner prior to construction. The start of construction will not be delayed due to the Contractors need to verify all field conditions. Verification of items must be scheduled by the Contractor so as not to impede the progress of the work. The Contractor shall be responsible for correcting damage resulting from Contractor's failure to verify field conditions. Architect/Engineer and Owner liability for accuracy of survey information.
  - 2. The implied intent of the Drawings, includes the overall layout of the Project, inclusive of site structures, site improvements, location of all items required during construction, the extent of construction and the extent of the materials.
  - 3. All such Drawings and Specifications constitute the Project as a whole, and are as a result, directly related to one another. The Drawings and Specifications are not divided into, or are intended to be divided into separate entities according to building trades or local practice. It is the responsibility of the Contractor to disseminate all information represented on the Drawings and Specifications so that all trades and sub-trades will have complete and thorough knowledge of the Project intent. No requests for Change Orders, time extensions, or other considerations will be accepted if the Contractor fails to properly coordinate information to the various trades/sub-trades.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION (NOT USED)

END OF SECTION 014200

## SECTION 014523 – TESTING AND INSPECTIONS

### PART 1 - GENERAL

#### 1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

#### 1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the testing and inspection requirements as specified herein.

#### 1.3 RELATED SECTIONS

- A. Requirements for testing and inspection shall be described in various Sections of these Specifications. Where no testing and inspection requirements are described but the Owner determines that it is necessary, the Owner may request additional testing and inspection to be performed at his own expense.
- B. Work Not Included
  - 1. Unless otherwise noted in this Section or other Section of work, the Owner will select a pre-qualified independent testing laboratory and inspection professional.
  - 2. Unless otherwise noted in this Section or other Sections of work, the Owner will pay for all initial services of the testing laboratory and inspection professionals as further described in Article 2.1 of this Section of these Specifications.

#### 1.4 QUALITY ASSURANCE

- A. The testing laboratory will be qualified to the Owner's approval in accordance with ASTM E 329-14a "Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection."
- B. Testing, when required, will be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing and Materials.

#### 1.5 PRODUCT HANDLING

- A. Promptly process and distribute all required copies of test reports and related instructions to ensure all necessary retesting and/or replacement of materials with the least possible delay in progress of the work.

### PART 2 - PRODUCTS

#### 2.1 PAYMENTS FOR TESTING AND INSPECTION SERVICES

- A. Initial Services: The Owner will pay for all initial testing and inspection services.



- B. Retesting: When initial tests and inspections indicate non-compliance with local Codes and the Contract Documents, all subsequent retesting occasioned by the non-compliance shall be performed by the same testing laboratory and inspectors and the costs thereof will be deducted by the Owner from the Contract Sum.

## 2.2 CODE COMPLIANCE TESTING AND INSPECTION

- A. Inspections and tests required by Codes or Ordinances, or by a plan approval authority, shall be paid for by the Owner unless otherwise noted in this Section or other Sections of work. Retesting or inspection as required shall conform to the requirements of Article 2.1 B of this Section.

## 2.3 CONTRACTOR'S TESTING

- A. Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.
- B. Where operating tests are specified, the Contractor shall test his work as it progresses, on his own account, and shall make satisfactory preliminary tests in all cases before applying for official tests.
- C. Tests shall be made in the manner specified, for the different branches of the work. Each test shall be made on the entire system for which such test is required, wherever practical. In case it is necessary to test portions of the work independently, the Contractor shall do so without extra compensation. The Contractor shall furnish all labor, material and apparatus, make corrections and conduct the official test. The test will be conducted in the presence of a representative of the Architect.
- D. All parts of the mechanical and electrical work and associated equipment shall be tested and adjusted to work properly and be left in perfect operating condition. All defects disclosed by these tests shall be corrected to the satisfaction of the Architect and Engineer without any additional cost to the Owner. Tests shall be repeated on this repaired or replaced work if deemed necessary by the Architect. The Architect shall be notified at least forty-eight (48) hours in advance of all tests, and shall be represented at tests that he deems necessary. The Contractor shall furnish all necessary instruments, other equipment, and personnel required for such tests.
- E. Required certificates of inspection, testing or approval shall be secured by the Contractor and promptly delivered by him to the Architect.
- F. If the Architect or Engineer is to observe the inspections, tests or approvals required by the Contract Documents, he will endeavor to do so promptly and, where practicable, at the source of supply.

## PART 3 - EXECUTION

### 3.1 COOPERATION WITH TESTING LABORATORY AND INSPECTORS

- A. Representatives of the testing laboratory and inspectors shall have access to the work at all times. Provide facilities for such access in order that they may properly perform their functions.

### 3.2 SCHEDULES

- A. Establishing Schedule: By advance discussions with the inspection service and testing laboratory selected by the Owner, determine the time required to perform inspections and tests and to issue each of its findings. Provide all required time within the construction schedule.
- B. Revising Schedule: When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with the inspectors and testing laboratory as required.
- C. Adherence to Schedule: When the testing laboratory is ready to test according to the determined schedule but is prevented from testing or taking specimens due to incompleteness of the work, all extra costs for testing attributable to the delay will be back-charged to the Contractor.

### 3.3 TAKING SPECIMENS

- A. All specimens and samples for testing, unless otherwise provided in these Contract Documents, will be taken by the testing laboratory; all sampling equipment and personnel will be provided by the testing laboratory; and all deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

END OF SECTION 014523

## SECTION 015000 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions, and other Division 01 Specification Sections, apply to this Section. In the event of any conflicts between the requirements of these Sections, the more stringent requirement shall apply.

#### 1.2 SUMMARY

- A. This Section includes requirements for construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection. Temporary utilities include, but are not limited to, the following:
  - 1. Temporary water service and distribution.
  - 2. Temporary electric power and light.
  - 3. Temporary heat.
  - 4. Telephone service.
  - 5. Sanitary facilities, including drinking water.
  - 6. Storm and sanitary sewer.
- B. Support facilities include, but are not limited to, the following:
  - 1. Field offices and storage sheds.
  - 2. Temporary roads, paving and truck wash-down station.
  - 3. Dewatering facilities and drains.
  - 4. Temporary enclosures.
  - 5. Hoists.
  - 6. Temporary project identification signs and bulletin boards.
  - 7. Waste disposal services.
  - 8. Rodent and pest control.
  - 9. Construction aids and miscellaneous services and facilities.
- C. Security and protection facilities include, but are not limited to, the following:
  - 1. Temporary fire protection.
  - 2. Barricades, warning signs, and lights.
  - 3. Sidewalk bridge or enclosure fence for the site.
  - 4. Environmental protection.
- D. The Contractor is responsible for all costs associated with the supply, maintenance or usage of temporary utilities and construction related facilities unless indicated otherwise in this Section.

#### 1.3 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.
- 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.

#### 1.4 PROJECT CONDITIONS

- A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.
- C. Provide waste removal services as required to maintain the site in a clean and orderly condition.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. General: Provide new materials. If acceptable to the Owner, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.
- B. Paint: Comply with requirements.
1. For job-built temporary offices, shops, sheds, fences, and other exposed lumber and plywood, provide exterior-grade acrylic-latex emulsion over exterior primer.
  2. For sign panels and applying graphics, provide exterior-grade alkyd gloss enamel over exterior primer.
- C. 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.
- D. Water: Provide potable water approved by local health authorities.

## 2.2 EQUIPMENT

- A. General: Provide new equipment. If acceptable to the Owner, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.
- B. Water Hoses: Provide 3/4-inch, heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.
- C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-Volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
- D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
- E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage.
- F. Fire Extinguishers: Provide hand-carried, portable, UL-rated; Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.
  - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work and the areas adjacent to the Work area. Relocate and modify facilities as required.
- B. 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.

### 3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.
  - 1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
  - 2. Provide adequate capacity at each stage of construction. Prior to temporary utility

- avail- ability, provide trucked-in services.
  3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
  4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner. Neither the Owner will accept cost or use charges as a basis of claims for Change Orders.
  5. Install services to cause minimum disruption to area's adjacent to the work area.
  6. Add provisions for work not in Contract but served by temporary facilities, if required.
- B. Water Service: Contractor may use existing water service in the area of work.
- C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switchgear. **Cost of temporary electric power usage is the Contractors responsibility. Cost shall be included in the bid.**
- D. Initial temporary service shall be three (3) phase, or single phase. Temporary light and power installations, wiring and miscellaneous electrical hardware must meet the electric code. Electrical characteristics shall be provided to meet all temporary light and power reasonably required as herein and hereinafter specified or as included under the general conditions. The contractor shall pay the cost of running temporary services. **All costs shall be included in the bid.**
1. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, ac 20 Ampere rating, and lighting circuits may be nonmetallic-sheathed cable where overhead and exposed for surveillance.
- E. Power outlets shall be fed independently of the temporary lighting system. The extension of service shall include the necessary wiring of sufficient capacity to the location of the well for the operation of the well pump in the event a water well is the source of water supply for the project. Where service of a type other than herein mentioned is required, the contractor requiring it shall pay all costs of such special service.
- F. Temporary Lighting: Provide temporary lighting with local switching. **Cost of temporary lighting usage is the contractors' responsibility. Cost shall be included in the bid.**
1. The contractor shall provide double sockets at a maximum of thirty feet (30') on centers in large areas. One (1) socket shall contain a 150-watt lamp and the other socket shall be a grounding type to accept a receptacle plug for small, single-phase loads to be used for short periods of time.
  2. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.
- G. The contractor shall observe the requirements of the Federal Occupational Safety and Health Act (OSHA) of 1970 with regard to temporary light and power.
- H. Temporary Heat: Provide temporary heat required by construction activities. Select safe equipment that will not have a harmful effect. **Any cost associated with the supply, maintenance and usage of temporary heat will be the responsibility of the contractor. Cost of temporary heat shall be included in the bid.**

- I. Use of gasoline-burning space heaters, open flame, or salamander heating units is prohibited.
- J. Should electricians be required to supervise and maintain equipment required for the provision of heat, the payment for the services of the supervisors and/or maintenance personnel shall be the responsibility of the Contractor. The contractor shall pay the cost of all fuel consumed in the operation of the generating unit for supplying temporary heat.
- K. All heating equipment shall be NFPA approved. Heaters shall be approved by a recognized testing laboratory and must be equipped with a positive shut-off safety valve. Notwithstanding the above, all temporary heating equipment will comply with all Federal and State laws and regulations.
- L. Temporary Telephones: Contractor shall utilize their own cell phones for service.
- M. The contractor may utilize the Owner's sanitary/wash facilities, drinking water, etc. if these amenities are available. The contractor shall only use these facilities with Owner's permission. The contractor will be responsible to reimburse the Owner for all Owner provided utilities use by the Contractor. Further, should the contractor elect to utilize Owner provided utilities the contractor will be responsible to repair all damage and replace all damaged items before the project will be considered substantially completed. The Owner will not be required to make final payment to the contractor until such damage is repair or replaced to its original or better than original condition.

### 3.3 SUPPORT FACILITIES INSTALLATION

- A. Temporary storage sheds are not permitted on the Owner's property.
- B. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
  - 1. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use UL-labeled, fire-retardant-treated material for framing and main sheathing.
- C. Temporary Lifts and Hoists: Contractor may utilize the existing elevator for bringing materials to the area of work and disposing materials to the area of work provided that:
  - 1. The Contractor provides temporary protection materials, padding, etc. for the elevator cab.
  - 2. The Contractor observes the weight capacity of the existing elevator cab.
  - 3. The Contractor is only permitted to use the existing elevator from the hours of 9:00 p.m. to 6:00 a.m. Monday through Friday.
  - 4. The Contractor notify the Owner of the elevator use three (3) business days prior to use.
- D. Project Identification and Temporary Signs: Prepare project identification and other signs of size indicated. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs.
  - 1. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.

- E. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.
  - 1. Provide containers with lids. Dispose of waste off-site periodically.
- F. Individual Project circumstances may require use of other construction aids and miscellaneous facilities, such as walkways, scaffoldings, platforms, swing stages, ramps and bridges, incidental sheeting and shoring, demolition waste chutes, and similar construction aids. Add requirements as necessary to suit Project.

### 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."
  - 1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stair- well.
  - 2. Store combustible materials in containers in fire-safe locations.
  - 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
  - 4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
- B. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- C. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
  - 1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- D. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid 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.
  - 1. No burning will be permitted on the site.
  - 2. It will be the Contractor's responsibility to control dust by a means acceptable to the Owner. The Contractor shall make due allowance in his bid to cover these non-productive costs.



E. Protection of Utilities:

1. The Contractor shall exercise special care when working near existing utility installations such as lights, ducts, structures, underground trench laid cables, cable markers, pads, water lines, underground oil lines, railroads and other installations, to ensure that no damage is done to them and that the underground wiring to such utilities is not damaged or rooted out, or pipelines broken or punctured.
2. If the Contractor damages any installation, the Contractor shall repair at no cost to the Owner the damaged item to the Owner's satisfaction. At the Owners discretion, repairs will be done continuously on a 24-hour per day basis until completed. The Contractor shall submit for approval the name of an electrical contractor and a plumbing contractor who shall be available on a 24 hour a day basis to affect any repairs as may be necessary due to Contractor error.
3. The Contractor shall obtain (if available) as-built site underground information prior to beginning excavation to minimize the possibility of interruption or damage to existing facilities. The lack of this information shall not excuse damage to the utilities by the contractor or the requirement to make necessary repairs immediately, the Contractor shall pay for Cost of the repair work.

F. Protection and Restoration of Property and Landscape: The Contractor shall be responsible for the preservation of all public and private property. All land monuments and property markers shall be preserved until the Owner has witnessed and recorded their location.

G. Protection of Existing Trees, Shrubs, and Vegetation to Remain: Contractor shall take all means necessary to protect existing trees, shrubs, and vegetation. Contractor and its forces shall abide by the boundaries set by the Drawings for the protection of root systems of all designated trees, shrubs and vegetation. Protection shall be completely in place prior to the start of construction work in any area. Contractor shall clearly mark all restricted areas as indicated on the Drawings and prevent the use of the area by all personnel and equipment until final cleanup.

H. Project Security:

1. The Contractor shall be responsible for monitoring all personnel requiring access to the work site including his personnel, subcontractor's personnel, other contractors working in the same construction area, material delivery trucks, authorized visitors to the site, etc.
2. The Contractor shall be held responsible for the security and protection of its own, sub- contractors and sub-subcontractors equipment, vehicles, trailers, tools, materials, and all other items necessary for the work under this Contract.
3. The Contractor shall be held responsible for the admission of any unauthorized personnel into his work area.
4. In general, provide security and facilities to protect Work, existing facilities, and the Owner's operations from unauthorized entry, vandalism or theft.

### 3.5 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. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
1. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

- C. Termination and Removal: Unless the Owner 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 existing permanent construction that may have been damaged as a result of the use, maintenance or operation of temporary facility for this project. Repair damaged new work, repair or replace, as directed by the Owner, existing work and or conditions, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired as a result of the use, maintenance or operation of temporary facilities for the project.
1. Where the area is intended for future landscape development, remove any material, equipment, debris, trash, soil and aggregate fill used as part or in conjunction with the project that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks damaged during and as a result of work conducted as part of this project. Replace and/or repair as required and direct by the governing authority and the Owner.

END OF SECTION 015000

## SECTION 016000 – PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

#### 1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete product requirements as specified herein, including, but not limited to, the following:
  - 1. Product delivery, storage and handling.
  - 2. Storage and protection.
  - 3. Identifying markings.
  - 4. Temporary use of equipment.
  - 5. General standards.

#### 1.3 RELATED SECTIONS

- A. Substitution Procedures - Section 012500.
- B. Execution Requirements - Section 017300.

#### 1.4 TRANSPORTATION AND HANDLING

- A. Materials, products, and equipment shall be properly containerized, packaged, boxed, and protected to prevent damage during transportation and handling.
- B. More detailed requirements for transportation and handling are specified under the technical Sections.

#### 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. 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 determine compliance with the Contract Documents and to determine 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 foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 IDENTIFYING MARKINGS

- A. Name plates and other identifying markings shall not be affixed on exposed surfaces of manufactured items installed in finished spaces.

1.7 PRODUCT APPROVAL STANDARDS

- A. Where the words "or approved equal" or other synonymous terms are used, it is expressly understood that they shall mean that the approval of any such submission is vested in the Architect, whose decision shall be final and binding upon all concerned. All submissions are subject to such approval and shall conform to the requirements of Article 1.8 herein.

1.8 TEMPORARY USE OF EQUIPMENT

- A. No equipment intended for permanent installation shall be operated for temporary purposes without the written permission of the Architect.
- B. The temporary or trial usage by the Owner of any mechanical device, machinery, apparatus, equipment or any work or materials supplied under this Contract before final completion and written acceptance by the Architect, shall not be construed as evidence of the acceptance of same by the Owner. The Owner shall have the privilege of such temporary and trial usage, for such reasonable length of time as and when the Architect shall deem to be proper for making a complete and thorough test of same and no claim for damage shall be made by the Contractor for the injury to or breaking of parts of such work which may be caused by weakness or inaccuracy of structural parts or by defective material or workmanship. If the Contractor so elects, he may at his own expense, place a competent person or persons to make such trial usage; such trial usage shall be under the supervision of the Contractor.

## 1.9 GENERAL REQUIREMENTS

- A. In the event that it is necessary for the Contractor to store any materials offsite, he shall first obtain the approval of the Architect. The Contractor shall be responsible for insurance and warehousing charges of any materials stored offsite. The Contractor shall also be responsible for the cost of delivery to the job site of any materials that have been stored offsite.
- B. Materials delivered to the job site shall be carefully stored and protected from damage. Damaged material shall not be used in the work. The Contractor shall provide, where directed temporary storage facilities as may be required for the storage of all materials which might be damaged by weather.
- C. Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the representative manufacturers, unless otherwise specified.
- D. Equipment, plant, and appliances, such as hoists, centering, concrete lifts, construction elevators, cranes, rigging, towers, derricks, walks, ramps, chutes, scaffolding, implements, transportation, cartage and other things necessary and required for the adequate execution of the work and as required by law and applicable Union rules shall be provided and shall be maintained in good and safe mechanical working order, be responsible for their safe use, and remove them when no longer required. Applicable requirements of OSHA shall become and form a part of this document.
- E. During handling and installation of work at project site clean and protect work in progress and adjoining work on a basis of perpetual maintenance. Apply suitable protective covering on newly installed work where reasonably required to ensure freedom from damage or deterioration at time of substantial completion; otherwise, clean and perform maintenance on newly installed work as frequently as necessary through remainder of construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- F. To extent possible through reasonable control and protection methods, supervise performance of work in a manner and by means which will ensure that none of the work whether completed or in progress, will be subjected to harmful, dangerous, damaging, or otherwise deleterious exposures during construction period. Such exposures include (where applicable, but not by way of limitation) static loading, dynamic loading, internal pressures, external pressures, high or low temperatures, thermal shock, high or low humidity, air contamination or pollution, water, ice, solvents, chemicals, light, radiation, puncture, abrasion, heavy traffic, soiling, bacteria, insect infestation, combustion, electrical current, high speed operation, improper lubrication, unusual wear, misuse, incompatible interface, destructive testing, misalignment, excessive weathering, unprotected storage, improper shipping/handling, theft and vandalism.
- G. Require installer of each major unit of work to inspect substrate to receive the work, and conditions under which the work will be performed, and to report (in writing to Contractor) unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.
- H. Where installations include manufactured products, comply with manufacturer's applicable instructions and recommendations for installation to whatever extent these are more explicit or more stringent than applicable requirements indicated in the Contract Documents.

- I. Inspect each item of materials or equipment immediately prior to installation and reject damaged and defective items.
- J. Provide attachment and connection devices and methods for securing work properly as it is installed; true to line and level, and within recognized industry tolerance if not otherwise indicated. Allow for expansions and building movements. Provide uniform joint widths in exposed work, organized for best possible visual effect. Refer questionable visual-effect choices to Architect for final decision.
- K. Recheck measurements and dimensions of the work as an integral step of starting each installation.
- L. Install work during conditions of temperature, humidity, exposure, forecasted weather, and status of project completion which will ensure best possible results for each unit of work in coordination with entire work. Isolate each unit of work from non-compatible work, as required to prevent deterioration.
- M. Coordinate enclosure (closing-in) of work with required inspections and tests, so as to avoid necessity of uncovering work for that purpose.
- N. Mounting Heights: Except as otherwise indicated, mount individual units of work at industry-recognized standard mounting heights, for applications indicated. In CMU walls mount units at height closest to manufacturer's recommendation so as to minimize cutting of block coursings. Refer questionable mounting height choices to Architect for final decision.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 016000

## SECTION 017300 – EXECUTION REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

#### 1.2 SECTION INCLUDES

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. General installation of products.
  - 2. Progress cleaning.
  - 3. Starting and adjusting.
  - 4. Protection of installed construction.
  - 5. Correction of the Work.

#### 1.3 RELATED SECTIONS

- A. Cutting and Patching - Section 017329.
- B. Closeout Procedures - Section 017700.

#### 1.4 SUBMITTALS

- A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

### PART 2 - PRODUCTS (NOT APPLICABLE)

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. 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.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility 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.

### 3.3 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. 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.
- G. 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.
- H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.4 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.
  - 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: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
  - 1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

- H. 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.
- I. 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.
- J. 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.
- K. 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.

### 3.5 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 Section 014000, "Quality Requirements."

### 3.6 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide continuous protection during construction of all finishes, including taped Masontie joints, 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.

### 3.1 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Section 017329, "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.

- E. Remove and replace operating components that cannot be repaired.
- F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

## SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

### 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 the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

#### 1.3 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- 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.

#### 1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
  1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

## 1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 7 days of date established for the Notice to Proceed.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
  - 1. Material category.
  - 2. Generation point of waste.
  - 3. Total quantity of waste in tons (tonnes).
  - 4. Quantity of waste salvaged, both estimated and actual in tons (tonnes).
  - 5. Quantity of waste recycled, both estimated and actual in tons (tonnes).
  - 6. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
  - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- C. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- D. 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.
- E. 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.
- F. Qualification Data: For refrigerant recovery technician.
- 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.

## 1.7 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

## 1.8 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between 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, site-clearing 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 where materials separation will be performed.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total nonhazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:
  - 1. Demolition Waste:
    - a. Asphalt paving.
    - b. Concrete.
    - c. Concrete reinforcing steel.
    - d. Brick.
    - e. Concrete masonry units.
    - f. Wood studs.
    - g. Wood joists.
    - h. Plywood and oriented strand board.
    - i. Wood paneling.

- j. Wood trim.
- k. Structural and miscellaneous steel.
- l. Rough hardware.
- m. Roofing.
- n. Insulation.
- o. Doors and frames.
- p. Door hardware.
- q. Windows.
- r. Glazing.
- s. Metal studs.
- t. Gypsum board.
- u. Acoustical tile and panels.
- v. Carpet.
- w. Carpet pad.
- x. Demountable partitions.
- y. Equipment.
- z. Cabinets.
- aa. Plumbing fixtures.
- bb. Piping.
- cc. Supports and hangers.
- dd. Valves.
- ee. Sprinklers.
- ff. Mechanical equipment.
- gg. Refrigerants.
- hh. Electrical conduit.
- ii. Copper wiring.
- jj. Lighting fixtures.
- kk. Lamps.
- ll. Ballasts.
- mm. Electrical devices.
- nn. Switchgear and panelboards.
- oo. Transformers.

2. Construction Waste:

- a. Masonry and CMU.
- b. Lumber.
- c. Wood sheet materials.
- d. Wood trim.
- e. Metals.
- f. Roofing.
- g. Insulation.
- h. Carpet and pad.
- i. Gypsum board.
- j. Piping.
- k. Electrical conduit.
- l. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
  - 1) Paper.
  - 2) Cardboard.
  - 3) Boxes.
  - 4) Plastic sheet and film.
  - 5) Polystyrene packaging.

- 6) Wood crates.
  - 7) Wood pallets.
  - 8) Plastic pails.
- m. Construction Office Waste: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following construction office waste materials:
- 1) Paper.
  - 2) Aluminum cans.
  - 3) Glass containers.

### PART 3 - EXECUTION

#### 3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
  - 1. Distribute waste management plan to everyone concerned within three 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.
- C. 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 and recycled.

#### 3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
  - 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: Salvage items for Owner's use and handle as follows:



1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
  3. Store items in a secure area until delivery to Owner.
  4. Transport items to Owner's storage area designated by Owner.
  5. Protect items from damage during transport and storage.
- D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- F. Plumbing Fixtures: Separate by type and size.
- G. Lighting Fixtures: Separate lamps by type and protect from breakage.
- H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

### 3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- 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 according to approved construction waste management plan.
1. Provide appropriately marked containers or bins for controlling recyclable waste until 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 from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

### 3.4 RECYCLING DEMOLITION WASTE

- A. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

- B. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
  - 1. Pulverize masonry to maximum 3/4-inch (19-mm) size.
  - 2. Clean and stack undamaged, whole masonry units on wood pallets.
- C. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- D. 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.
- E. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- F. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- G. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- H. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.
- I. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
  - 1. Store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- J. Carpet Tile: Remove debris, trash, and adhesive.
  - 1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- K. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.
- L. Conduit: Reduce conduit to straight lengths and store by material and size.
- M. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

### 3.5 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. 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.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

D. Paint: Seal containers and store by type.

### 3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged or recycled, 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. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner's property.

C. Burning: Do not burn waste materials.

END OF SECTION 017419

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## SECTION 017700– CONTRACT CLOSEOUT

### 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. In the event of any conflicts between the requirements of these Sections, the more stringent requirement shall apply.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Inspection procedures.
  - 2. Project record document submittal.
  - 3. Operation and maintenance manual submittal.
  - 4. Submittal of warranties.
  - 5. Final cleaning.
- B. Closeout requirements for specific construction activities are included in the appropriate Drawings.

#### 1.3 SUBSTANTIAL COMPLETION

- A. Substantial Completion: The date of Substantial Completion for the Work, or designated portion thereof, is the date certified by the Architect when the construction is sufficiently complete, in accordance with the Contract Documents, so that the Owner may occupy the project, or the designated portions thereof, for the use for which it was intended PRIOR to the Mandatory Completion Date. Substantial Completion shall be accomplished and the full project and all designated portions thereof, read for use and occupancy by the Owner by the completion milestone deadline listed below. It shall be the responsibility of the Contractor to notify the Architect and Owner in not less than seven (7) calendar days prior to the Substantial Completion Milestone deadline for a “substantial completion” inspection. The University shall issue a Certificate of Substantial Completion (AIA Document G704) at the point in time when the inspection has been fully completed and the appropriate approvals and certificates have been granted by governing authorities and obtained by the Contractor.
  - 1. IT IS THE INTENT OF THESE SPECIFICATIONS THAT SUBSTANTIAL COMPLETION IS ACHIEVED NO LATER THAN THE DATES AS OUTLINED IN SECTION 011000 “SUMMARY”. **THE CONTRACTOR MUST INCLUDE ANY AND ALL COSTS INCLUDING ANY OVERTIME NECESSARY TO ATTAIN SUBSTANTIAL COMPLETION BY THE DEADLINE LISTED IN SECTION 011000 BASED UPON BEING AWARDED THE PROJECT BY THE DATE LISTED IN SECTION 011000.**
- B. **LIQUIDATED DAMAGES ARE PART OF THIS PROJECT. These will be assessed at the following rates:**
  - 1. \$1,000.00 per day beyond substantial completion.

- C. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List items below that are incomplete in request.
1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.
    - a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
    - b. If 100 percent completion cannot be shown, include a list of incomplete items (a project punch list), the value of incomplete construction, reasons the Work is not complete, and a timeline during which the work must be completed.
  2. Advise Owner of pending insurance changeover requirements.
  3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
  4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
  6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  8. Complete startup testing of systems and instruction of the Owner's operation and maintenance personnel.
  9. Disconnect and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  10. When mechanical, electrical or other equipment is installed, it shall be the responsibility of the contractor to maintain, warrant and operate it for such period of time as required by the contract documents or as necessary for the proper inspecting and testing of the equipment for adequately instructing the University's operating personnel. All costs associated with the maintenance, warranty, operations, inspection and testing of equipment in addition to instructing University personnel shall be borne by the contractor. All tests shall be conducted in the presence of and upon timely notice to the contracting officer, Owner's Project Manager and Architect/Engineer prior to acceptance of the equipment.
  11. Owner's warranties will start at Final Acceptance of the Project.
- D. Pre-final Inspection:
1. When the Contractor has completed all work and is satisfied the Project is in compliance with the Contract Documents, it will notify the Owner and Architect, in writing, that the Project is complete and ready for inspection. The Owner and Architect will arrange for and conduct an inspection of the Project by the Owner, Architect, Engineers and the Contractor. The Owner will be provided with a reasonable time to arrange for and conduct an inspection.

2. The Owner and Architect will document any deficiencies on a written punch list and will arrange a meeting with the Contractor to review the punch list, explain deficient items and designate a time frame in which the punch list must be completed. The Contractor will correct all the deficiencies within the designated time frame and notify the Owner in writing, when the Project is ready for re-inspection. The Owner will arrange and conduct the re-inspection of the Project to review the corrected items.
3. The formal list of deficiencies found shall not be considered a final list of all deficient items. Any deficiencies found during instructions to the Owner, inspection for Substantial Completion, beneficial occupancy, or inspection for final acceptance, the Contractor will correct all deficient items per the contract documents prior to final acceptance.

E. Substantial Completion:

1. Upon completion of deficient items and instruction to the Owner, the Contractor will arrange for an inspection of the Project with the Owner and the Architect. This inspection may result in a list of additional items to complete after occupancy, but before final payment and/or may require additional correction prior to occupancy by the Owner.
2. Upon formal notice from the Owner, the Contractor shall then arrange for the submission of all outstanding record documents, including: maintenance manuals, guarantees, warranties, maintenance contracts, and any additional instructions necessary for the operation of the project. The Contractor shall acquaint the Owner with acceptance tests, guarantees, warranties, and maintenance manuals. The Contractor shall also obtain a 'Certificate of Occupancy' or similar releases required to permit the Owner's occupancy of the Project.
3. Should the inspection period find deficiencies, the Owner will notify the Contractor in writing of deficient items.
4. If the inspection confirms that the Project is 'substantially complete' and is 'ready for occupancy', the Owner through the Architect/Engineer will issue a "Certificate of Substantial Completion". The Certificate will confirm that the Project can be occupied for its intended use. Attached to the Certificate will be any final punch list to be completed. Prior to issuance of the Certificate, the Contractor shall submit a schedule for completion of remaining deficiencies, approved or amended by the Owner.
5. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
  - a. The Architect will repeat inspection when requested and assured that the Work is substantially complete.
  - b. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 BENEFICIAL OCCUPANCY

- A. Upon issuance of the 'Certificate of Substantial Completion', the Owner may then occupy the Project (or the designated area of the Project).

1.5 FINAL ACCEPTANCE

- A. Final Inspection: Upon completion of any remaining deficiencies the Contractor shall notify the Owner in writing, that the Project is complete and ready for final inspection. The Contractor shall arrange for and conduct the final inspection of the Project with the Owner.

- B. Final Acceptance: If the final inspection indicates satisfactory completion of the Work, the Owner through the Architect/Engineer will issue a Change Order adjusting to the final quantities. Following acceptance of the final Change Order, receipt of required affidavits, final release of liens, consent of surety for final payment along with all other documentation required by the contractor documents, the Owner through the Architect will authorize a final Certificate for Payment.
1. Mandatory or Final Completion: Final Completion shall be accomplished and the full project, and all designated portions thereof, completed and ready for use without any further work required within the time frame identified for each phase of work from the date of issuance and as listed on the Certificate of Substantial Completion by the Architect.
  2. The guarantee period for all materials, equipment and workmanship shall start on the date of 'Final Acceptance' unless otherwise noted on the Certificate.
- C. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
  2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
  3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, endorsed and dated by the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Architect.
  4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the Owner took possession of and assumed responsibility for corresponding elements of the Work.
  5. Submit consent of surety to final payment.
  6. Submit a final liquidated damages settlement statement.
  7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- D. Re-inspection Procedure: The Architect will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Owner.
1. Upon completion of re-inspection, the Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Architect will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
  2. If necessary, re-inspection will be repeated.
  3. Should the Project require inspections beyond the inspections noted above, i.e. a pre-final and a final inspection only the Owner will reduce from the Contractor's final payment those monies necessary to provide for the cost of the additional inspections. The reduction shall not be considered as a part of any "Liquidated Damages" for failure to complete within the specified Contract Time. The reduction shall not be considered as a penalty to the Contractor; but shall be for the actual cost of monies required for the reimbursement of fees for the Architect, Engineers, Owner and any other specialists necessary for obtaining final approval of the Work.



## 1.6 EXCESSIVE DEFICIENCIES

- A. During any inspection for Project completion, if it is determined by the Owner, that the Contractor has not sufficiently completed the Work in compliance with the Contract Documents, the Owner may declare that the Project is not sufficiently complete to continue the inspection of the Work. Within three (3) working days of this declaration, the Owner will issue in writing, a list of excessive deficiencies found. Upon receipt of the Owners notice of excessive deficiencies the Contractor will have ten (10) working days to remove such deficiencies. If such deficiencies have not been corrected in the time frame herein specified the Owner can at its' option complete the Work. Any costs incurred by the Owner as a result of its' assuming the responsibilities of the Contractor in this regard will be deducted from any monies remaining to be paid to the Contractor. Should the costs associated with the Owner having to assume responsibility for the work to correct excessive deficiencies exceed the amount of funds remaining to be paid the Contractor shall be liable to the Owner for the difference.

## 1.7 RECORD DOCUMENT SUBMITTALS

- A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the Architect's reference during normal working hours.
1. **All of the record documentation listed herein shall be provided by the Contractor in hard copy and digitally. Digital copies shall be provided by the Contractor in PDF format, and issued to the Owner via CD. Hard copy shall be provided by the Contractor in an 8-1/2" x 11" binder.**
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
  2. Mark new information that is important to the Owner but was not shown on Contract Drawings or Shop Drawings.
  3. Note related change-order numbers where applicable.
  4. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
- C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.
1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
  2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
  3. Note related record drawing information and Product Data.
  4. Upon completion of the Work, submit record Specifications to the Architect for the Owner's records.

- D. Record Product Data: Maintain one copy of each Product Data submittal. Note related Change Orders and markup of record drawings and Specifications.
1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.
  2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
  3. Upon completion of markup, submit complete set of record Product Data to the Architect for the Owner's records.
- E. Record Sample Submitted: Immediately prior to Substantial Completion, the Contractor shall meet with the Architect and the Owner's personnel at the Project Site to determine which Samples are to be transmitted to the Owner for record purposes. Comply with the Owner's instructions regarding delivery to the Owner's Sample storage area.
- F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to the Architect for the Owner's records.
- G. Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-inch (51-mm), 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:
1. Emergency instructions.
  2. Spare parts list.
  3. Copies of warranties.
  4. Wiring diagrams.
  5. Recommended "turn-around" cycles.
  6. Inspection procedures.
  7. Shop Drawings and Product Data.
  8. Fixture lamping schedule.
- H. Roughing Drawings and Operating Manuals: Plumbing, HVAC, electrical and other machinery and mechanical equipment items requiring utility service connections shall have their respective shop drawings accompanied by manufacturer's certified roughing drawings indicating accurate locations and sizes of all service utility connections.
- I. Sleeve and Opening Drawings: Prior to installing service utilities or other piping, etc. through structural elements of the building, the contractor shall prepare and submit accurate dimensioned drawings to the Construction Manager for approval of the Architect and/or Structural Engineer for approval indicating the positions and sizes of all sleeves and openings required to accommodate his/her work and installation of his/her piping, equipment, etc. and all with reference to the established dimensional grid of the building. Such drawings must be submitted in sufficient time to allow proper coordination with reinforcing steel shop drawings and proper placing in the field.

- J. Control Valve and Circuit Location Charts and Diagrams: The contractor shall prepare a complete set of inked or typewritten control valve and circuit location diagrams, charts, diagrams and lists under frame glass in appropriate designed equipment rooms as directed. The contractor shall also furnish one-line diagrams as well as such color-coding of piping and wiring and identifying charges as specified or required. This information is to be framed under glass and installed where directed. The Contractor shall also provide the University a second complete set of the control valve and circuit location diagrams, charts, diagrams and lists not under glass.
- K. Warranties:
1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within the (10) days after completion of the applicable item of work. Leave the date of beginning of time of warranty until the Date of Final Acceptance of the building and prior to receipt of final payment.
  2. Make other submittals within ten (10) days after Date of Substantial Completion, prior to final Application for Payment.
  3. For items of Work for which acceptance is delayed beyond the Date of Substantial Completion, submit within (10) days after written acceptance, listing the date of acceptance as the beginning of the warranty period. Final payment will not be approved until the Owner has received all warranties.
  4. Warranty periods for all items installed as part of the Work under this Contract will start at 'Final Acceptance' of the entire scope of Work on the Project.
  5. Co-execute submittals when required.
  6. Warranty Manual: Bind all warranties and bonds in a commercial type 8 1/2" X 11" three D side ring binder with durable plastic covers.
    - a. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of General Contractor and equipment suppliers; and name of responsible company principal.
    - b. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of the product or work item.
    - c. Transmit two (2) copies of the "Warranties Manual" to the University prior to submission of Final Application for Payment.
  7. A certificate of Asbestos shall certify that no asbestos or asbestos-containing products are or have been installed as part of this project.

## 1.8 CLOSEOUT PROCEDURES

- A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
1. Maintenance manuals.
  2. Record documents.
  3. Spare parts and materials.
  4. Tools.
  5. Lubricants.
  6. Fuels.
  7. Identification systems.

8. Control sequences.
  9. Hazards.
  10. Cleaning.
  11. Warranties and bonds.
  12. Maintenance agreements and similar continuing commitments.
- B. As part of instruction for operating equipment, demonstrate the following procedures:
1. Startup.
  2. Shutdown.
  3. Emergency operations.
  4. Noise and vibration adjustments.
  5. Safety procedures.
  6. Economy and efficiency adjustments.
  7. Effective energy utilization.
- C. Allow a minimum of three (3) hours training for all of the Owners personnel who will be involved with the maintenance or operation for each piece of equipment or system that requires any type of maintenance or operation.
- D. For equipment, or component parts of equipment put into service during construction and operated by the Owner, submit completed documents within ten (10) days after written acceptance and prior to receipt of final payment.
- E. The contractor shall submit the as-built documents to the Owner's Project Manager for review by the Architect/Engineer whether altered or not with a certification as to the accuracy of the information thereon at the time of contract completion and before final payment will be made to the contractor. After acceptance by the Architect/Engineer, the contractor will furnish two (2) sets of all shop and/or erection drawings used for as-built documentation.
1. All as-built drawings as submitted by the contractor shall be labeled "as-built" and dated above the title block. This information shall be checked, edited and certified by the Architect/Engineer who shall then transpose such information from the contractor's as-built drawings to the original tracings and certify that such tracing reflect "as-built" status and deliver said tracings to the University. Where shop drawings have been used by the contractor for as-built documentation the tracing provided shall include cross-reference information, which shall be included in the set of as-built drawings furnished to the University. The Contractor shall be responsible for and shall pay for the cost of erasable transparencies for its as-built drawings.

## PART 2 - PRODUCTS

### 2.1 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

### 3.1 FINAL CLEANING

- A. General: The General Conditions require general cleaning during construction. Regular site cleaning is included in Division 01 Section "Construction Facilities and Temporary Controls."
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.
    - a. Remove labels that are not permanent labels.
    - b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are vision-detracting materials. Replace chipped or broken glass and other damaged transparent materials.
      - 1) removal of putty stains from glass and mirrors; wash and polish inside and outside;
    - c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean and dust free. Vacuum carpeted surfaces.
      - 1) removal of spots, paint and soil from resilient, glaze and unglazed masonry and ceramic flooring and wall work;
    - d. Vacuum as required and advisable and wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps to a mark free condition.
    - e. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, mud, stones and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.
      - 1) restoration of all landscaping, roadway and walkways to pre-existing condition; damage to trees and plantings shall be repaired in the next planting season and such shall be guaranteed for one (1) year from date of repair and/or replanting;
    - f. removal of marks, undesirable stains, fingerprints, other soil, dust or dirt from painted, decorated or stained woodwork, plaster or plasterboard, metal acoustic tile and equipment surfaces;
    - g. removal of temporary floor protections; clean, wash or otherwise treat and/or polish all finished floors as directed;
    - h. clean exterior and interior metal surfaces, including doors and window frames and hardware, of oil stains, dust, dirt, paint and the like; polish where applicable and leave without fingerprints or blemishes;

- i. removal of all pollutants of any kind or nature deposited or remaining upon the site or upon the University's property as a result of the construction work on this project;
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests.
- D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.
- E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.
- 1. Where extra materials of value remain after completion of associated Work, they become the Owner's property. Dispose of these materials as directed by the Owner.

END OF SECTION 017700

## SECTION 017820 - OPERATION AND MAINTENANCE DATA

### 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. In the event of any conflicts between the requirements of these Sections, the more stringent requirement shall apply.

#### 1.2 SUMMARY

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the operation and maintenance data as specified herein.
- B. This 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. Maintenance manuals for the care and maintenance of products, materials, and finishes systems and equipment.
- C. Related Sections include the following:
  - 1. Division 01 Section "Summary" for coordinating operation and maintenance manuals covering the Work of multiple contracts.
  - 2. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
  - 3. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
  - 4. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
  - 5. Divisions 02 through 48 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

#### 1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

## 1.4 SUBMITTALS

- A. Initial Submittal: Submit two (2) draft copies of each manual at least fifteen (15) calendar days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Owner will return one copy of draft and mark whether general scope and content of manual are acceptable.
  - 1. In lieu of hard copies, Contractor may submit digital copies in PDF format.
- B. Final Submittal: Submit two copies of each manual in final form at least fifteen (15) calendar days before final inspection. Architect will return copy with comments within 15days after final inspection.
  - 1. Submit four (4) sets prior to final inspection, bound in 8-1/2" X 11" binders with durable plastic covers, acceptable to the Owner.
  - 2. In addition, Contractor shall submit digital copy in PDF format.
  - 3. Submit final volumes revised, to the authorized representative of the Owner as required in these Contract Documents.

## 1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

## PART 2 - PRODUCTS

### 2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
  - 1. List of documents.
  - 2. List of systems.
  - 3. List of equipment.
  - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

### 2.2 MANUALS, GENERAL



- A. 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.
- B. Title Page: Enclose title page in transparent plastic sleeve. 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, address, and telephone number of Contractor.
  6. Name and address of Architect.
  7. Cross-reference to related systems in other operation and maintenance manuals.
- C. 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.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. 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.
1. Binders: Heavy-duty, 3-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. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
  2. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets. These manuals shall include a complete description of all systems and equipment, diagrams indicating connectors, oiling requirements, types of lubricants to be used and method of operating equipment. Included within the manuals shall be a list of names, addresses and telephone numbers of sub- contractors involved in the installation and firms capable of performing services for each mechanical item.
  3. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. 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. Internally subdivide the binders contents with permanent page dividers, logically organized as described below and with tab titling clearly printed under reinforced laminated plastic tabs.

- a. PART 1: Directory, listing names, addresses, contact persons and telephone numbers of Architects, Engineers, Contractors, Subcontractors and suppliers.
  - b. PART 2: Maintenance instructions subdivided by MasterSpec Format Sections as listed within these Contract Documents. For each Section identify names, addresses, contact persons and telephone numbers of Subcontractors and suppliers. Identify the following (in addition to the items listed in "G" above):
    - 1) Significant design criteria
    - 2) List of equipment.
    - 3) Parts list for each component.
    - 4) Maintenance instructions for equipment and systems.
    - 5) Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.
4. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
  5. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
  6. 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.

## 2.3 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.

## 2.4 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.
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.
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.

## 2.5 PRODUCT MAINTENANCE MANUAL

- 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.
  - 1. Include procedures to follow and required notifications for warranty claims.

## 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- 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 printed 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 videotape, 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.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts, Extra Materials and Maintenance Materials
1. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections. If there are no quantities specified then provide a minimum of five percent (5%) of:
    - a. all interior finish materials (attic stock).
    - b. the number of lamps and ballast needed for every light fixture.
    - c. the total number of automatic light sensors
    - d. the total number of each filter type required for each Mechanical Unit requiring filters.
  2. Provide 100% of all spare parts necessary to operate and maintain all equipment and building systems within the design parameters and/or as recommended by the manufacturer or supplier.
  3. Deliver to Owner's Project Manager and obtain receipt prior to final payment.
  4. 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. Special Tools

1. Provide any “special tools” (one of each type) if required as part of the operation and maintenance of any of the systems herein specified. “Special tools” are devices that are considered unique to a specified system and necessary for maintenance and operation of that system, and not normally part of the maintenance department inventory.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

### PART 3 - EXECUTION

#### 3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. 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.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. 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.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. 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.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

- F. 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.
  - 2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."
- G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017820

## SECTION 017839 - PROJECT RECORD DOCUMENTS

### 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 project record documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.
  - 4. Miscellaneous record submittals.
- B. Related Requirements:
  - 1. Section 017300 "Execution" for final property survey.
  - 2. Section 017700 "Closeout Procedures" for general closeout procedures.
  - 3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one set(s) of marked-up record prints.
  - 2. Number of Copies: Submit copies of record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit PDF electronic files of scanned record prints and one of file prints.
      - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal:
      - 1) Submit PDF electronic files of scanned record prints and three set(s) of prints.
- B. Record Specifications: Submit one paper copy and annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one paper copy and annotated PDF electronic files and directories of each submittal.



1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy and annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

#### 1.4 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
  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 provide information for preparation of corresponding 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 acceptable drawing technique.
    - c. Record data as soon as possible after obtaining it.
    - d. Record and check the markup before enclosing concealed installations.
    - e. Cross-reference record prints to corresponding archive photographic documentation.
  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 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 and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  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 Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
  1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
  2. Format: DWG, Version current, Microsoft Windows operating system.
  3. Format: Annotated PDF electronic file with comment function enabled.
  4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
  5. Refer instances of uncertainty to Architect for resolution.
  6. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
    - a. See Section 013300 "Submittal Procedures" for requirements related to use of Architect's digital data files.
    - b. Architect will provide data file layer information. Record markups in separate layers.
- C. 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. Format: Annotated PDF electronic file with comment function enabled.
  3. Record Digital Data Files: Organize digital data 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 digital data file.
  4. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect.
    - e. Name of Contractor.

## 1.5 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. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
  3. Note related Change Orders, record Product Data, and record Drawings where applicable.

- B. Format: Submit record Specifications as annotated PDF electronic file, or scanned PDF electronic file(s) of marked-up paper copy of Specifications.

## 1.6 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. 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, record Specifications, and record Drawings where applicable.
- C. Format: Submit record Product Data as annotated PDF electronic file and paper copy.
  - 1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

## 1.7 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.
- B. Format: Submit miscellaneous record submittals as PDF electronic file.
  - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

## 1.8 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents 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 reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

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## SECTION 018200 - DEMONSTRATION AND TRAINING

### 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. In the event of any conflicts between the requirements of these Sections, the more stringent requirement shall apply.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
  - 3. Demonstration and training videotapes.
- B. Related Sections include the following, as applicable to this project:
  - 1. Division 01 Section "Allowances" for administrative and procedural requirements for demonstration and training allowances.
  - 2. Division 01 Section "Project Management and Coordination" for requirements for pre-instruction conferences.
  - 3. Divisions 02 through 48 Sections for specific requirements for demonstration and training for products in those Sections.
- C. Allowances: Furnish demonstration and training instruction time under the Demonstration and Training Allowance as specified in Division 01 Section "Allowances."
- D. Unit Price for Instruction Time: Length of instruction time will be measured by actual time spent performing demonstration and training in required location. No payment will be made for time spent assembling educational materials, setting up, or cleaning up.

#### 1.3 SUBMITTALS

- A. Instruction Program: Submit one (1) copy of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. At completion of training, submit one (1) complete training manual(s) for Owner's use.
- B. Qualification Data: For instructors.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

- E. Demonstration and Training Video: Submit one (1) copy within seven (7) days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

- a. Name of Project.
- b. Name and address of photographer.
- c. Name of Architect.
- d. Name of Contractor.
- e. Date videotape was recorded.
- f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

#### 1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Control Requirements," experienced in operation and maintenance procedures and training.
- C. Photographer Qualifications: A professional photographer who is experienced photographing construction projects.
- D. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
1. Inspect and discuss locations and other facilities required for instruction.
  2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  3. Review required content of instruction.
  4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

#### 1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

## PART 2 - PRODUCTS

### 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
  - 1. Motorized doors, including overhead coiling doors, overhead coiling grilles, and automatic entrance doors.
  - 2. Equipment, including stage equipment, projection screens, loading dock equipment, waste compactors, food-service equipment, residential appliances and laboratory fume hoods, etc.
  - 3. Fire-protection systems, including fire alarm, fire pumps and fire-extinguishing systems.
  - 4. Intrusion detection systems.
  - 5. Conveying systems, including elevators, wheelchair lifts, escalators and cranes.
  - 6. Medical equipment, including medical gas equipment and piping.
  - 7. Laboratory equipment, including laboratory air and vacuum equipment and piping.
  - 8. Heat generation, including boilers, feed water equipment, pumps, steam distribution piping, and water distribution piping.
  - 9. Refrigeration systems, including chillers, cooling towers, condensers, pumps and distribution piping.
  - 10. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
  - 11. HVAC instrumentation and controls.
  - 12. Electrical service and distribution, including transformers, switchboards, panel boards, uninterruptible power supplies and motor controls.
  - 13. Packaged engine generators, including transfer switches.
  - 14. Lighting equipment and controls.
  - 15. Communication systems, including intercommunication, surveillance, clocks and programming, voice and data and television equipment.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
  - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.

2. Documentation: Review the following items in detail:
  - a. Emergency manuals.
  - b. Operations manuals.
  - c. Maintenance manuals.
  - d. Project Record Documents.
  - e. Identification systems.
  - f. Warranties and bonds.
  - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
  - a. Instructions on meaning of warnings, trouble indications, and error messages.
  - b. Instructions on stopping.
  - c. Shutdown instructions for each type of emergency.
  - d. Operating instructions for conditions outside of normal operating limits.
  - e. Sequences for electric or electronic systems.
  - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
  - a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
  - a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
  - a. Diagnostic instructions.
  - b. Test and inspection procedures.



7. Maintenance: Include the following:
  - a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
8. Repairs: Include the following:
  - a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

### 3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
  2. Owner will furnish an instructor to describe Owner's operational philosophy.
  3. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  1. Schedule training with Owner with at least seven (7) calendar days' advance notice.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral and a demonstration performance-based test.
- E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

### 3.3 DEMONSTRATION AND TRAINING VIDEOTAPES

- A. General: Engage a qualified commercial photographer to record demonstration and training video. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
  - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Recorded Format: MPG file to be provided to the Owner's Project Manager.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
- D. Narration: Describe scenes on recording by dubbing audio narration off-site after videotape is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.
- E. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

END OF SECTION 018200

## SECTION 024119 - SELECTIVE DEMOLITION

### 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. Demolition and removal of selected portions of building or structure.
  - 2. Demolition and removal of selected site elements.
  - 3. Salvage of existing items to be reused or recycled.
- B. Related Requirements:
  - 1. Section 017300 "Execution" for cutting and patching procedures.

#### 1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

#### 1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.

- B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
  - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
  - 3. Coordination for shutoff, capping, and continuation of utility services.
  - 4. Use of elevator and stairs.
  - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- D. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.
- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- F. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

#### 1.7 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

#### 1.8 FIELD 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.
- 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 not expected that hazardous materials will be encountered in the Work.
  - 1. Hazardous materials will be removed by Owner before start of the Work.

2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- 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.
  1. Maintain fire-protection facilities in service during selective demolition operations.

#### 1.9 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

#### 1.10 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

- D. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs or video.
  - 1. Comply with requirements specified in Section 013233 "Photographic Documentation."
  - 2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

### 3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

### 3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
  - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
  - 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
    - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

### 3.4 PROTECTION

- A. Temporary Protection: 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. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

- B. Remove temporary barricades and protections where hazards no longer exist.

### 3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
4. Maintain fire watch during and for at least one hour after flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
8. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

- B. Removed and Salvaged Items:

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. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

- C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
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.

- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

### 3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

### 3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."
  - 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.
  - 3. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

### 3.8 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 035413 - GYPSUM CEMENT UNDERLAYMENT

### 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 gypsum-cement-based, self-leveling underlayment for application below interior floor coverings. Underlayment shall be applied where carpet or resilient flooring is scheduled. Limit of application shall be determined based upon field conditions.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: Signed by manufacturers of underlayment and floor-covering systems certifying that products are compatible.
- C. Minutes of preinstallation conference.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.
- B. Product Compatibility: Manufacturers of underlayment and floor-covering systems certify in writing that products are compatible.
- C. Fire-Resistance Ratings: Where indicated, provide gypsum-cement underlayment systems identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- D. Preinstallation Conference: Conduct conference at Project site.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

## 1.7 FIELD CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.
  - 1. Place gypsum-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F (10 and 27 deg C).

## 1.8 COORDINATION

- A. Coordinate application of underlayment with requirements of floor-covering products and adhesives, to ensure compatibility of products.

# PART 2 - PRODUCTS

## 2.1 GYPSUM-CEMENT UNDERLAYMENTS

- A. Underlayment: Gypsum-cement-based, self-leveling product that can be applied in minimum uniform thickness of 1/8 inch (3 mm) to match adjacent floor elevations.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Allied Custom Gypsum; AccuCrete, AccuRadiant.
    - b. Ardex; GS-4 Self-Leveling Repair Underlayment, LU-100 Self-Leveling Flooring Underlayment.
    - c. Euclid Chemical Company (The); Flo-Top.
  - 2. Cement Binder: Gypsum or blended gypsum cement as defined by ASTM C 219.
  - 3. Compressive Strength: Not less than 2000 psi (13.8 MPa) at 28 days when tested according to ASTM C 72.
  - 4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.
- B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm); or coarse sand as recommended by underlayment manufacturer.
  - 1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.
- C. Water: Potable and at a temperature of not more than 70 deg F (21 deg C).
- D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

1. Primer shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for conditions affecting performance of the Work.
- B. Proceed with application only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. General: Prepare and clean substrate according to manufacturer's written instructions.
  1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
  2. Fill substrate voids to prevent underlayment from leaking.
- B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.
  1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/100 sq. m) in 24 hours.
- C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

### 3.3 APPLICATION

- A. General: Mix and apply underlayment components according to manufacturer's written instructions.
  1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
  2. Coordinate application of components to provide optimum adhesion to substrate and between coats.
  3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
- B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Apply underlayment to produce uniform, level surface.
  1. Apply a final layer without aggregate to product surface.
  2. Feather edges to match adjacent floor elevations.

- D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
- F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

### 3.4 PROTECTION

- A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 035413

## SECTION 055000 - METAL FABRICATIONS

### 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. Steel framing and supports for mechanical and electrical equipment.
  - 2. Steel framing and supports for low partitions or millwork bracing where called for.
  - 3. Steel framing and supports for applications where framing and supports are not specified in other Sections.

#### 1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Paint products.
  - 2. Grout.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
  - 1. Steel framing and supports for countertops.
  - 2. Steel framing and supports for mechanical and electrical equipment.
  - 3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
  - 4. Shelf angles.
  - 5. Slotted Channel Framing.

- C. Delegated-Design Submittal: For Slotted Channel Framing, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

## 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
  - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

## 1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders, slotted channel framing (Unistrut type) and all supplementary metal supports for suspended items.

## 2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.
- D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

- E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- F. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- G. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
  - 1. Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm).
  - 2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33 (Grade 230), with G90 (Z275) coating; 0.079-inch (2-mm) nominal thickness.
  - 3. Material: Cold-rolled steel, ASTM A 1008/A 1008M, structural steel, Grade 33 (Grade 230); 0.0677-inch (1.7-mm) minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.
- H. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- I. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- J. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- K. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
- L. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (extruded architectural bronze).
- M. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).
- N. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500.
- O. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

## 2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
  - 1. Provide stainless-steel fasteners for fastening aluminum.
  - 2. Provide stainless-steel fasteners for fastening stainless steel.
  - 3. Provide stainless-steel fasteners for fastening nickel silver.
  - 4. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3 (ASTM A 325M, Type 3); with hex nuts, ASTM A 563, Grade C3 (ASTM A 563M, Class 8S3); and, where indicated, flat washers.

- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593 (ASTM F 738M); with hex nuts, ASTM F 594 (ASTM F 836M); and, where indicated, flat washers; Alloy Group 1 (A1).
- E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
  - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- G. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
  - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

## 2.4 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- B. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- H. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).



## 2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

## 2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  - 1. Fabricate units from slotted channel framing where indicated.

- 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

## 2.7 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.
  - 1. Provide mitered and welded units at corners.
  - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches (50 mm) larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize and prime shelf angles located in exterior walls.
- D. Prime shelf angles located in exterior walls with zinc-rich primer.
- E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

## 2.8 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

## 2.9 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
  - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
  - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

## 2.10 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.
- B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
  1. Cast Aluminum: Heavy coat of bituminous paint.

2. Extruded Aluminum: Two coats of clear lacquer.

### 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports securely to, and rigidly brace from, building structure.

### 3.3 INSTALLING THRESHOLDS

- A. Seal thresholds exposed to exterior with elastomeric sealant complying with Section 079200 "Joint Sealants" to provide a watertight installation.

### 3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

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## 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. Wood blocking, cants, and nailers.
  - 2. Plywood backing panels.

#### 1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater size but less than 5 inches nominal (114 mm actual) size in least dimension.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
  - 2. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
  - 1. Fire-retardant-treated wood.
  - 2. Power-driven fasteners.
  - 3. Post-installed anchors.
  - 4. Metal framing anchors.

## 1.6 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.

## 1.7 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. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

## 2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
  - 1. Treatment shall not promote corrosion of metal fasteners.
  - 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

1. For exposed lumber indicated to receive a painted, stained, or natural finish, mark end or back of each piece.
- E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.
- F. Application: Treat all interior miscellaneous carpentry unless otherwise indicated. Items indicated on Drawings, and may include the following:
  1. Framing for raised platforms.
  2. Concealed blocking.
  3. Plywood backing panels.

## 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. Furring.
- B. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber of any of the following species:
  1. Hem-fir (north); NLGA.
  2. Mixed southern pine or southern pine; SPIB.
  3. Spruce-pine-fir; NLGA.
  4. Hem-fir; WCLIB or WWPA.
  5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
  6. Western woods; WCLIB or WWPA.
  7. Northern species; NLGA.
  8. Eastern softwoods; NeLMA.
- 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.
- E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

## 2.4 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.



## 2.5 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 of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Screws for Fastening to Metal Framing: ASTM C 954, length as recommended by screw manufacturer for material being fastened.
- D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 ICC-ES AC58 as appropriate for the substrate.
  - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
  - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

## 2.6 METAL FRAMING ANCHORS

- A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
  - 1. Use for interior locations unless otherwise indicated.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- C. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- 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.
  - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
- 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.
  - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.
  - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
- H. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- 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 screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

### 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

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## SECTION 072100 - THERMAL 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:
  - 1. Mineral-wool blanket.
- B. Related Requirements:
  - 1. Section 092900 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
  - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
  - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

## PART 2 - PRODUCTS

### 2.1 MINERAL-WOOL BLANKETS

- A. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Industrial Insulation Group, LLC (IIG-LLC).
    - b. ROXUL.
    - c. Thermafiber, Inc.; an Owens Corning company.
  - 2. Locations: Filling miscellaneous voids in the exterior wall.

### 2.2 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
  - 1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
  - 2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.
- B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
  - 1. Angle: Formed from 0.030-inch- (0.762-mm-) thick, perforated, galvanized carbon-steel sheet with each leg 2 inches (50 mm) square.
  - 2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation.
- C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.
  - 1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
    - a. Ceiling plenums.
- D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

## 2.3 ACCESSORIES

- A. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

### 3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
  - 4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
  - 1. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

### 3.4 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

## SECTION 078413 - PENETRATION FIRESTOPPING

### 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. Penetrations in fire-resistance-rated walls.
  - 2. Penetrations in horizontal assemblies.
  - 3. Penetrations in smoke barriers.

- B. Related Requirements:

- 1. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include samples of tags as indicated in 3.4.B "Identification".

- B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

- 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.



- B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

## 1.6 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

## 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

## 1.9 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
  - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
    - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
      - 1) UL in its "Fire Resistance Directory."

## 2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. 3M Fire Protection Products.
    - b. Hilti, Inc.
    - c. Specified Technologies, Inc.
    - d. Tremco, Inc.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
  - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
  - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
  - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
  - 1. Permanent forming/damming/backing materials.
  - 2. Substrate primers.
  - 3. Collars.
  - 4. Steel sleeves.

## 2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

## 2.4 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
  - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

### 3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
  - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
  - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 IDENTIFICATION

- A. Wall Identification: Refer to Section 101420 "Code Required Signage" for additional information.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
  - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
  - 2. Contractor's name, address, and phone number.

3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

### 3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

### 3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

### 3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Penetration Firestopping Systems with No Penetrating Items:
  1. UL-Classified Systems: C-AJ- 0070.
  2. F-Rating: 2 hour.
  3. T-Rating: 2 hour.
  4. Type of Fill Materials: As required to achieve rating.
  5. Maximum Opening Size: 7 inches.
  6. Locations: Filling holes in rates labs or concrete/CMU walls.
- C. Penetration Firestopping Systems for Metallic Pipes, Conduit, or Tubing (at metal framed drywall partitions):
  1. UL-Classified Systems: W-L-1054.
  2. F-Rating: 1 and 2 hour.
  3. T-Rating: 0 hour.
  4. Type of Fill Materials: As required to achieve rating.

5. Penetrants: Maximum 30 inch schedule 10 or heavier steel pipe; Maximum 30 inch service weight or heavier cast iron pipe; Maximum 6 inch conduit; Maximum 4 inch EMT; Maximum 6 inch Type L or heavier copper pipe.
- D. Penetration Firestopping Systems for Metallic Pipes, Conduit, or Tubing (at concrete or CMU floors or partitions):
1. UL-Classified Systems: C-AJ-1109.
  2. F-Rating: 2 and 3 hour.
  3. T-Rating: 0 hour.
  4. Type of Fill Materials: As required to achieve rating.
  5. Penetrants: Maximum 4 inch rigid galvanized steel conduit; Maximum 4 steel electrical metallic tubing; Maximum 4 inch Schedule 10 or heavier steel pipe.
- E. Penetration Firestopping Systems for Nonmetallic Pipe, Conduit, or Tubing:
1. UL-Classified Systems: F-B-2029.
  2. F-Rating: 3 hour.
  3. T-Rating: 0 and 2 hour.
  4. Type of Fill Materials: As required to achieve rating.
  5. Penetrants: Maximum 4 inch schedule 40 PVC pipe; Maximum 4 inch Schedule 40 ABS pipe; Maximum 4 inch SDR 13.5 CPVC pipe; Maximum 4 inch Schedule 40 rigid nonmetallic pipe.
- F. Penetration Firestopping Systems for Electrical Cables (at metal framed drywall partitions):
1. UL-Classified Systems: W-L-1243.
  2. F-Rating: 1 and 2 hour.
  3. T-Rating: 0 hour.
  4. Type of Fill Materials: As required to achieve rating.
  5. Penetrants: Maximum 2 inch diameter aluminum or steel flexible metal conduit.
- G. Penetration Firestopping Systems for Miscellaneous Electrical Penetrants (at metal framed drywall partitions):
1. UL-Classified Systems: W-L-3047.
  2. F-Rating: 2 hours.
  3. T-Rating: 3/4 hour.
  4. Type of Fill Materials: As required to achieve rating.
  5. Penetrants: Maximum 7/C No. 12 AWG cables with PVC jacket and insulation. Maximum opening diameter of 6 inches.
- H. Penetration Firestopping Systems for Miscellaneous Mechanical Penetrants:
1. UL-Classified Systems: W-L-7040.
  2. F-Rating: 1 hour, 2 hours.
  3. T-Rating: 1 hour, 2 hours.
  4. Type of Fill Materials: As required to achieve rating.
- I. Penetration Firestopping Systems for Groupings of Penetrants:
1. UL-Classified Systems: W-L-8014.
  2. F-Rating: 1 hour, 2 hours, 3 hours, 4 hours.
  3. T-Rating: 0 hour.

4. Type of Fill Materials: As required to achieve rating.
5. Penetrants: Maximum 36 inch x 4 inch cable tray, Nominal 12 inch (or smaller) schedule 10 (or heavier) steel pipe, nominal 1 inch (or smaller) cast or ductile iron pipe, nominal 4 inch or smaller steel EMT or 6 inch conduit, nominal 6 inch (or smaller) regular (or heavier) copper pipe, maximum 4 inch cable bundle.
6. Pipe Coverings: Nominal 1-1/2 inch thick hollow cylindrical heavy density glass fiber jackets with metal jackets.

END OF SECTION 078413

## SECTION 078443 - JOINT FIRESTOPPING

### 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. Joints in or between fire-resistance-rated constructions.
  - 2. Joints in smoke barriers.

- B. Related Requirements:

- 1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers and for wall identification.
  - 2. Section 092216 "Non-Structural Metal Framing" for firestop tracks for metal-framed partition heads.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. Include samples of tags as indicated in 3.4 "Identification".

- B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

- 1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.



- B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

## 1.6 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

## 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

## 1.9 COORDINATION

- A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of joints to accommodate joint firestopping systems.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
  - 1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
    - a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
      - 1) UL in its "Fire Resistance Directory."

## 2.2 JOINT FIRESTOPPING SYSTEMS

- A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. 3M Fire Protection Products.
  - b. Hilti, Inc.
  - c. Specified Technologies, Inc.
  - d. Thermafiber, Inc.; an Owens Corning company.
  - e. Tremco, Inc.
- C. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.
  - 1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
- D. Joints at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems with rating determined per ASTM E 2307.
  - 1. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
- E. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).
- F. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- G. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
  - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
  - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

### 3.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:
  - 1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
  - 2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
  - 3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 IDENTIFICATION

- A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
  - 1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
  - 2. Contractor's name, address, and phone number.
  - 3. Designation of applicable testing agency.
  - 4. Date of installation.

5. Manufacturer's name.
6. Installer's name.

### 3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

### 3.6 CLEANING AND PROTECTION

- A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

### 3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.
- B. Concrete Floor-to-Floor, Joint Firestopping Systems:
  1. UL-Classified Systems: FF-D- 1000-1999.
- C. Concrete Wall-to-Wall, Joint Firestopping Systems:
  1. UL-Classified Systems: WW-D- 0091.
- D. Bottom-of-Gypsum Wall-to-Concrete Floor, Joint Firestopping Systems:
  1. UL-Classified Systems: BW- S- 0001.
- E. Bottom-of-Gypsum/Gypsum Shaft Wall-to-Concrete Floor, Joint Firestopping Systems:
  1. UL-Classified Systems: BW- S- 0016.
- F. Concrete or Block Wall-to-Flat Concrete Floor (Top-of-Wall), Joint Firestopping Systems:
  1. UL-Classified Systems: HW- S- 0055.

G. Gypsum Wall-to-Flat Concrete Floor (Top-of-Wall), Joint Firestopping Systems:

1. UL-Classified Systems: HW- D- 0016.

H. Gypsum Shaft Wall-to- Top-of-Wall, Joint Firestopping Systems:

1. UL-Classified Systems: HW- D- 0119.

END OF SECTION 078443

## SECTION 079200 - JOINT SEALANTS

### 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 joint sealants for the applications indicated in the Joint-Sealant Schedule at the end of Part 3.

- 1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:

- a. Joints between different materials listed above.
    - b. Perimeter joints between materials listed above and frames of windows.
    - c. Other joints as indicated.

- 2. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:

- a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints of exterior openings where indicated.
    - c. Perimeter joints between interior wall surfaces and frames of interior doors.
    - d. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - e. Other joints as indicated.

- 3. Interior joints in the following horizontal traffic surfaces:

- a. Other joints as indicated.

- B. Related Requirements:

- 1. Section 079219 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.
- C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
  - 1. Joint-sealant location and designation.
  - 2. Manufacturer and product name.
  - 3. Type of substrate material.
  - 4. Proposed test.
  - 5. Number of samples required.
- D. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- E. Field-Adhesion-Test Reports: For each sealant application tested.
- F. Sample Warranties: For special warranties.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
  - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

## 1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
  2. Conduct field tests for each kind of sealant and joint substrate.
  3. Notify Architect seven days in advance of dates and times when test joints will be erected.
  4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
    - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
      - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
  6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

## 1.8 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
  2. When joint substrates are wet.
  3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## 1.9 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two years from date of Final Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.



1. Warranty Period: Five years from date of Final Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
  1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
  2. Disintegration of joint substrates from causes exceeding design specifications.
  3. Mechanical damage caused by individuals, tools, or other outside agents.
  4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

### 2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.
- C. Definitions: Definitions below are taken from ASTM C 920.
  1. Type S: Single component, typically air or moisture cured.
  2. Type M: Two or more components chemically cured.
  3. Grade P: Pourable/self-leveling sealant.
  4. Grade NS: Nosag sealants.
  5. Classes: The number represents the percent of contraction or expansion of the original joint width.
    - a. 12-1/2: Nonmoving-type joints to joints with minimal movement.
    - b. 25: Joints designed for moderate amount of movement.
    - c. 35: Joints designed for moderate amount of movement.
    - d. 50: Joints designed for moderate amount of movement. Typically used in building façade systems and glazing.
    - e. 100/50: Sealant capable of handling movement of 50% contraction and 100% expansion. Joints designed for high amounts of movement; commonly used in facades of buildings in high-wind and/or seismic regions
  6. Use T (Traffic): Sealants used in joints subjected to vehicular or pedestrian traffic.
  7. Use NT (Nontraffic): Used in horizontal joints not exposed to traffic, and for joints in walls, around fenestration, etc.
  8. Use I (Immersible): Sealants designed for use in areas subjected to water immersion.
  9. Use (related to material):
    - a. M: Sealants used in contact with mortar
    - b. G: Sealants used in contact with glass
    - c. A: Sealants used in contact with aluminum
    - d. O: Sealants used in contact with all other materials other than those previously listed.

## 2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. GE Construction Sealants; Momentive Performance Materials Inc. SilPruf LM SCS2700.
    - b. Dow Corning; 790.
    - c. Sika Corporation; Sikasil WS-290, Sikasil WS-290-FPS
  2. Locations: Interior perimeter joints of exterior openings.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dow Corning Corporation. 888 Silicone Joint Sealant
    - b. May National Associates, Inc.; a subsidiary of Sika Corporation.
    - c. Pecora Corporation; 301 NS
    - d. Sika Corporation; Joint Sealants. Sikasil 728 NS
  2. Locations: Horizontal joints on traffic (and non-traffic) surfaces of paving joints, expansion joints and saw cut joints.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Silicone, S, P, 100/50, T, NT: Single-component, pourable, plus 100 percent and minus 50 percent movement capability traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 100/50, Uses T and NT.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dow Corning Corporation: 890-SL Silicone Joint Sealant
    - b. May National Associates, Inc.; a subsidiary of Sika Corporation.
    - c. Pecora Corporation; 300 SL
    - d. Sika Corporation; Joint Sealants. Sikasil 728 SL.
  2. Locations: Horizontal joints on traffic (and non-traffic) surfaces of paving joints, expansion joints and saw cut joints.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

## 2.3 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

- B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dow Corning Corporation: 790 Silicone Building Sealant
    - b. May National Associates, Inc.; a subsidiary of Sika Corporation.
    - c. Pecora Corporation; 890FTS
    - d. Sika Corporation; Sikasil WS-290, Sikasil WS-290 FPS.
    - e. Tremco Incorporated. Spectrem 1
  2. Joint Locations:
    - a. Construction joints in cast-in-place concrete.
    - b. Joints between plant-precast architectural concrete units.
    - c. Control and expansion joints in unit masonry.
    - d. Joints in dimension stone cladding.
    - e. Joints in exterior insulation and finish systems.
    - f. Joints between metal panels.
    - g. Joints between different materials listed above.
    - h. Perimeter joints between materials listed above and frames of doors and windows.
    - i. Other joints as indicated on Drawings.
- C. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dow Corning Corporation. 756 SMS Building Sealant
    - b. GE Construction Sealants; Silpruf NB.
    - c. Pecora Corporation. 864NST
    - d. Sika Corporation; Joint Sealants. Sikasil WS-295, Sikasil WS-295 FPS
    - e. Tremco Incorporated. Spectrem 2, Spectrem 3
  2. Joint Locations:
    - a. Construction joints in cast-in-place concrete.
    - b. Joints between plant-precast architectural concrete units.
    - c. Control and expansion joints in unit masonry.
    - d. Joints in dimension stone cladding.
    - e. Joints in exterior insulation and finish systems.
    - f. Joints between different materials listed above.
    - g. Perimeter joints between materials listed above and frames of doors and windows.
    - h. Other joints as indicated on Drawings.
- D. Silicone, Nonstaining, S, NS, 100/50, T, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. Dow Corning Corporation. 790 Silicone Building Sealant.

## 2.4 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. BASF Corporation; MasterSeal CR 195 (formerly Sonolastic Ultra, MBS2014), MasterSeal NP 1 (formerly Sonolastic NP1, MBS2014).
    - b. LymTal International
    - c. Sika Corporation; Joint Sealants. Sikaflex 1a
  2. Locations: Isolation joints in cast-in-place concrete slabs, control and expansion joints in stone flooring, control and expansion joints in brick flooring, control and expansion joints in tile flooring.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

## 2.5 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth. Contractor has the option to submit either product below.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT. With fungicide.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dow Corning Corporation. 786
    - b. GE Construction Sealants; SC S1700 Sanitary.
    - c. Pecora Corporation. 898NST
    - d. Sika Corporation; Sikasil GP
    - e. Tremco Incorporated. Tremsil 600.
  2. Locations: Joints between walls and epoxy counters. Joints between plumbing fixtures and adjoining walls, floors, and counters, Tile control and expansion joints where indicated.
  3. Joint-Sealant Color: Clear.
- C. STPE, Mildew Resistant, S, NS, 50, NT: Mildew-resistant, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silyl-terminated polyether sealant joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT. With fungicide.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. BASF Corporation; MasterSeal NP 150 (formerly Sonolastic 150 VLM)
2. Locations: Joints between plumbing fixtures and adjoining walls, floors, and counters, Tile control and expansion joints where indicated.
3. Uses: M, A, and, as applicable to joints indicated, O.
4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

## 2.6 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. BASF Corporation; Construction Systems.
    - b. May National Associates, Inc.; a subsidiary of Sika Corporation.
    - c. Pecora Corporation. AC-20+
    - d. The Sherwin Williams Company; 950A
    - e. Sika Corporation; Sika Bondaflex Sil A 700
    - f. Tremco Incorporated. Tremflex 834
  2. Locations: Perimeter joints between interior wall surfaces and frames of interior doors and windows, perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

## 2.7 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

## 2.8 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Exterior insulation and finish systems.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.
    - b. Glass.
    - c. Porcelain enamel.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

### 3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
  - 1. Extent of Testing: Test completed and cured sealant joints as follows:
    - a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
  - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect tested joints and report on the following:
  - a. Whether sealants filled joint cavities and are free of voids.
  - b. Whether sealant dimensions and configurations comply with specified requirements.
  - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

### 3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

### 3.7 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Concealed interior joints in horizontal traffic surfaces.

1. Joint Locations:



- a. Isolation joints in cast-in-place concrete slabs.
    - b. Other joints as indicated on Drawings.
  2. Joint Sealant: Urethane, S, P, 25, T, NT.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Concealed interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
  1. Joint Locations:
    - a. Control joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
    - c. Other joints as indicated on Drawings.
  2. Joint Sealant: Acrylic latex.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Concealed mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
  1. Joint Locations:
    - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - b. Tile control and expansion joints where indicated.
    - c. Other joints as indicated on Drawings.
  2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT or STPE, Mildew Resistant, S, NS, 50, NT.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Exposed interior joints.
  1. Joint Locations:
    - a. Interior wall surfaces
    - b. Frames of interior doors and windows
    - c. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances
    - d. Joints between plumbing fixtures and adjoining walls, floor and counters
    - e. All other exposed interior locations not described above, unless otherwise noted.

END OF SECTION 079200

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## SECTION 079219 - ACOUSTICAL JOINT SEALANTS

### 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 acoustical joint sealants.
- B. Related Requirements:
  - 1. Section 079200 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each acoustical joint sealant.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of acoustical joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Acoustical-Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of acoustical joint sealant, for tests performed by a qualified testing agency.
- B. Sample Warranties: For special warranties.

## 1.5 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Final Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.

### 2.2 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. GE Construction Sealants; RCS20 Acoustical.
- b. Hilti, Inc.; Smoke and Acoustical Sealant CP 506
- c. Pecora Corporation; AC-20 FTR
- d. Tremco Incorporated; Tremco Acoustical Sealant
- e. United States Gypsum Company; USG Sheetrock Brand Acoustical Sealant

2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nonsag, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber acoustical sealant.

1. Manufacturers: Subject to compliance with requirements, available manufacturers, in addition to the ones listed above, offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Pecora Corporation.
- b. Serious Energy Inc. QuietSeal Pro Acoustical Sealant

### 2.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by acoustical-joint-sealant manufacturer where required for adhesion of sealant to joint substrates.

- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or

harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.
- C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

### 3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

### 3.5 PROTECTION

- A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

### 3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exposed Acoustical Joint Sealants.
  - 1. Joint Locations:
    - a. Openings and penetrations through STC rated partitions.
    - b. Perimeter ceiling grids, during installation.
  - 2. Joint Sealant: Acrylic latex.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Concealed Acoustical Joint Sealants.
  - 1. Joint Locations:
    - a. Penetrations through partitions in concealed spaces.
    - b. Top and bottom of partition, drywall to structure.
  - 2. Joint Sealant: Synthetic-rubber.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079219

## SECTION 080671 – DOOR HARDWARE SCHEDULE

### 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 references specification sections relating to commercial door hardware for the following:
  - 1. Swinging doors.
  - 2. Sliding Doors.
  - 3. Other doors to the extent indicated.
- B. Commercial door hardware includes, but is not necessarily limited to, the following:
  - 1. Mechanical door hardware.
  - 2. Electromechanical and access control door hardware.
  - 3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
  - 4. Automatic operators.
  - 5. Cylinders specified for doors in other sections.
- C. Related Sections:
  - 1. Division 08 Section "Door Hardware".
  - 2. Division 28 Section "Access Control Hardware Devices".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - 2. ICC/IBC - International Building Code.
  - 3. NFPA 70 - National Electrical Code.
  - 4. NFPA 80 - Fire Doors and Windows.
  - 5. NFPA 101 - Life Safety Code.
  - 6. NFPA 105 - Installation of Smoke Door Assemblies.
  - 7. State Building Codes, Local Amendments.
- E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

### 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.
  - 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. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.
- D. 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.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.



- F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

#### 1.4 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".

#### 1.5 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

#### 1.6 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. Refer to "PART 3 – EXECUTION" for required specification sections.

### PART 3 - EXECUTION

#### 3.1 DOOR HARDWARE SETS

- A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
  - 1. Quantities listed are for each pair of doors, or for each single door.
  - 2. The supplier is responsible for handling and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
  4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.
1. Section 08 71 00 – Door Hardware.
  2. Section 28 15 00 – Access Control Hardware Devices.
- C. Manufacturer's Abbreviations:
1. MK - McKinney
  2. SU - Securitron
  3. RO - Rockwood
  4. SA - SARGENT
  5. PE - Pemko
  6. OT - Other

### **Hardware Sets**

#### **Set: 1.0**

Doors: [EX-4-03](#)

6 Hinge, Full Mortise	<a href="#">TA2714 [NRP] FT</a>	US26D	MK	087100
1 Electric Power Transfer	<a href="#">EL-CEPT</a>	630	SU	087100
1 Dust Proof Strike	<a href="#">570</a>	US26D	RO	087100
1 Self Latch Flush Bolt Set	<a href="#">2845 / 2945 (as required)</a>	US26D	RO	087100
1 Access Control Mort Lock	<a href="#">SN210-82271 LNL LC</a>	US26D	SA	281500
1 Cylinder	<a href="#">As Required</a>	US32D	SA	087100
1 Coordinator	<a href="#">2600 Series (Size to opening)</a>	Black	RO	087100
2 Mounting Bracket	<a href="#">2601AB / C (Type as req)</a>	Black	RO	087100
2 Surface Closer	<a href="#">281 O/P9 (Arm to suit)</a>	EN	SA	087100
2 Kick Plate	<a href="#">K1050 10" high BEV CSK</a>	US32D	RO	087100
2 Wall Stop	<a href="#">RM860 (or) RM861 (As Required)</a>	US26D	RO	087100
2 Silencer	<a href="#">608</a>		RO	087100
1 ElectroLynx Harness - Frame	<a href="#">QC-C1500P</a>		MK	087100
1 ElectroLynx Harness - Door	<a href="#">QC-CXXX (Size as required)</a>		MK	087100
1 Power Supply	<a href="#">AQL4-R8E1 x Relays as Required</a>		SU	087100
1 Wiring Diagram	<a href="#">Elevation and Point to Point as Specified</a>		OT	

Notes:

Operational narrative: Authorized access by valid credential or key unlocking trim. Free egress. REX switch allows exit without alarm condition. Door position switches monitor open/closed status. Door remains latched and secure (fail secure) in event of power loss or fire alarm.

**Set: 2.0**

Doors: 4-108, 4-114

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Electric Power Transfer	EL-CEPT	630	SU	087100
1 Access Control Mort Lock	SN210-82271 LNL LC	US26D	SA	281500
1 Cylinder	As Required	US32D	SA	087100
1 Surface Closer	281 CPS	EN	SA	087100
1 Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
3 Silencer	608		RO	087100
1 ElectroLynx Harness - Frame	QC-C1500P		MK	087100
1 ElectroLynx Harness - Door	QC-CXXX (Size as required)		MK	087100
1 Power Supply	AQL4-R8E1 x Relays as Required		SU	087100
1 Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes:

Operational narrative: Authorized access by valid credential or key unlocking trim. Free egress. REX switch allows exit without alarm condition. Door position switches monitor open/closed status. Door remains latched and secure (fail secure) in event of power loss or fire alarm.

**Set: 3.0**

Doors: 4-113

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Storeroom/Closet Lock	LC 8204 LNL	US26D	SA	087100
1 Cylinder	As Required	US32D	SA	087100
1 Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100
1 Gasketing	S88BL		PE	087100

**Set: 4.0**

Doors: 4-110, 4-111, 4-112

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Office/Entry Lock	LC 8205 LNL	US26D	SA	087100
1 Cylinder	As Required	US32D	SA	087100
1 Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100
3 Silencer	608		RO	087100

**Set: 5.0**

Doors: 4-101, 4-102, 4-104, 4-106, 4-107

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Passage Latch	8215 LNL	US26D	SA	087100
1 Concealed Overhead Stop	1530S Series	EN	SA	087100
3 Silencer	608		RO	087100

END OF SECTION 080671

## 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. Interior standard steel doors and frames.
- B. Related Requirements:
  - 1. Section 081423.16 Plastic-Laminate-Faced Wood Doors for wood doors installed in hollow metal frames.
  - 2. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

#### 1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

#### 1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
  - 1. Elevations of each door type, including hardware mounting locations.
  - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
  - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.

4. Locations of reinforcement and preparations for hardware.
  5. Details of each different wall opening condition.
  6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
  7. Details of anchorages, joints, field splices, and connections.
  8. Details of accessories.
  9. Details of moldings, removable stops, and glazing.
- C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.
- D. Hollow metal shop drawings will not be reviewed by the Architect unless accompanied or preceded by the hardware and glazing schedules.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ceco Door; ASSA ABLOY.
  2. Curries Company; ASSA ABLOY.
  3. L.I.F. Industries, Inc.
  4. Mesker Door Inc.
  5. Pioneer Industries.
  6. Republic Doors and Frames.
  7. Steelcraft; an Allegion brand.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
  - 1. Smoke- and Draft-Control Assemblies: Provide assemblies with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

## 2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2; SDI A250.4, Level B. At all interior locations.
  - 1. Doors:
    - a. Type: As indicated in the Door and Frame Schedule.
    - b. Thickness: 1-3/4 inches (44.5 mm).
    - c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
    - d. Edge Construction: Continuously welded with no visible seams.
    - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
    - f. Core: Vertical steel stiffener.
    - g. Fire-Rated Core: Manufacturer's standard vertical steel stiffener core for fire-rated doors.
  - 2. Frames:
    - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
    - b. Frames: Fabricated from same thickness material as adjacent door frame.
    - c. Construction: Full profile welded.
  - 3. Exposed Finish: Prime.

## 2.4 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
  - 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).

3. Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at top of underlayment.
- D. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
  1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M; hot-dip galvanized according to ASTM A 153/A 153M, Class B.

## 2.5 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- G. Glazing: Comply with requirements in Section 088000 "Glazing."
- H. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M. Provide bituminous coating on back of frames to be grouted.
- I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

## 2.6 FABRICATION

- A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.



1. 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 welding.
  2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
  2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- C. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.
1. Provide stops and moldings flush with face of door, and with beveled stops unless otherwise indicated.
  2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
  4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
  5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

## 2.7 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## PART 3 - EXECUTION

### 3.1 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. Touch up factory-applied finishes where spreaders are removed.

- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

### 3.2 INSTALLATION

- A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11 or NAAMM-HMMA 840.
  - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
    - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    - b. Install frames with removable stops located on secure side of opening.
  - 2. Fire-Rated Openings: Install frames according to NFPA 80.
  - 3. Floor Anchors: Secure with postinstalled expansion anchors.
    - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
  - 4. Solidly pack mineral-fiber insulation inside frames at partitions with STC ratings.
  - 5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents at exterior doors.
  - 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
  - 7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
    - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
  - 1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8.
  - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
  - 3. Smoke-Control Doors: Install doors according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

### 3.3 CLEANING AND TOUCHUP

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

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## 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 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Solid-core doors with faces.
  - 2. Factory finishing flush wood doors.
  - 3. Factory fitting flush wood doors to frames and factory machining for hardware.

- B. Related Requirements:

- 1. Section 081113 "Hollow Metal Doors and Frames".
  - 2. Section 087100 "Door Hardware".
  - 3. Section 088000 "Glazing" for glass view panels in flush wood doors.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

- 1. Dimensions and locations of blocking.
  - 2. Dimensions and locations of mortises and holes for hardware.
  - 3. Dimensions and locations of cutouts.
  - 4. Undercuts.
  - 5. Requirements for veneer matching.
  - 6. Doors to be factory finished and finish requirements.
  - 7. Fire-protection ratings for fire-rated doors.
  - 8. Door elevations shall include mounting locations for hardware.

- C. Samples for Initial Selection: For factory-finished doors.

- D. Samples for Verification:

- 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), 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 finished Work.

2. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

#### 1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  1. Build mockups of one folding display door within wall assembly. Door shall be 36 inches wide by full height. Partition shall extend at least twelve inches out from both the hinge and latch side. Mock up shall also include all operating hardware and a rough mock-up of the sound panel framing (provide at thickness required in whatever materials can simulate the specified product depth).

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

#### 1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

#### 1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
    - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
  2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

3. Warranty Period for Solid-Core Interior Doors: Life of installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Basis-of-Design Product: Subject to compliance with requirements, provide Masonite Aspiro Series, Select Wood Veneer Doors or a comparable product by one of the following:
  1. Eggers Industries.
  2. Graham Wood Doors; ASSA ABLOY Group Company.
  3. Mohawk Flush Doors, Inc.
  4. VT Industries Inc.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

### 2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and AWI's "Architectural Woodwork Standards."
  1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
- B. WDMA I.S.1-A Performance Grade:
  1. Extra Heavy Duty unless otherwise indicated.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
  1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
  2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
- D. Particleboard-Core Doors:
  1. Particleboard: ANSI A208.1, or Grade LD-2.
  2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
  3. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.
- E. Structural-Composite-Lumber-Core Doors:
  1. Structural Composite Lumber: WDMA I.S.10.

- a. Screw Withdrawal, Face: 700 lbf (3100 N).
- b. Screw Withdrawal, Edge: 400 lbf (1780 N).

F. Mineral-Core Doors:

- 1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
- 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
- 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.
  - a. Screw-Holding Capability: 550 lbf (2440 N) per WDMA T.M.-10.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

- 1. Grade: Premium, with Grade AA faces.
- 2. Species: Clear Red Oak.
- 3. Cut: Plain sliced.
- 4. Match between Veneer Leaves: Slip/Balance match.
- 5. Assembly of Veneer Leaves on Door Faces: Running match.
- 6. Pair and Set Match: Provide for doors hung in same opening.
- 7. Exposed Vertical and Top Edges: Applied wood-veneer edges of same species as faces and covering edges of faces - edge Type B.
- 8. Core: Particleboard and Structural composite lumber.
- 9. Construction: Seven plies, either bonded or nonbonded construction.
- 10. Finish: Transparent, Factory finished unless otherwise indicated.

2.4 VISION PANEL FRAMES

A. Wood beads frames for Vision Panels in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

- 1. Wood Species: Same species as door faces.
- 2. Profile: Flush rectangular beads.

B. Wood-veneered frames for Vision Panels in Fire-Rated Wood Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and listed and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

- 1. Comply with NFPA 80 requirements for fire-rated doors.



- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, 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: Factory cut and trim openings through doors.
  - 1. Light Openings: Trim openings with moldings of material and profile indicated.
  - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

## 2.6 SHOP PRIMING

- A. Doors for Opaque Finish: Shop prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 099123" Interior Painting."

## 2.7 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. Factory finish doors.
- C. Transparent Finish:
  - 1. Grade: Premium.
  - 2. Finish: WDMA TR-8, UV curable, acrylated polyurethane.
  - 3. Staining: As selected by Architect from manufacturer's full range.
  - 4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
  - 5. Sheen: Satin.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
  - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  - 2. Reject doors with defects.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
  - 1. Install fire-rated doors according to NFPA 80.
  - 2. Install smoke- and draft-control doors according to NFPA 105.
- C. Job-Fitted Doors (for fire rated doors): Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
  - 1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
    - a. Comply with NFPA 80 for fire-rated doors.
    - b. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
  - 2. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

### 3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

## SECTION 083113 - ACCESS 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 access doors and frames, including security access doors, for walls and ceilings.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Product Schedule: For access doors and frames.
- C. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, according to NFPA 252 or UL 10B.

#### 2.2 ACCESS DOORS AND FRAMES

- A. Flush Access Doors with Concealed Flanges:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Acudor Products, Inc.
    - b. Babcock-Davis.
    - c. Elmdor/Stoneman Manufacturing Company; a division of Acorn Engineering Company.

- d. MIFAB, Inc.
    - e. Nystrom, Inc.
  - 2. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
  - 3. Locations: Wall and ceiling.
  - 4. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage, factory primed.
  - 5. Frame Material: Same material and thickness as door.
  - 6. Lock: Prepared for mortise cylinder.
- B. Recessed Access Doors with Concealed Flanges:
- 1. Manufacturer shall be the same as selected in section A.
  - 2. Description: Door face recessed 5/8 inch (16 mm) for gypsum board infill; with concealed flange for gypsum board installation and concealed hinge.
  - 3. Locations: Wall and ceiling surfaces within public corridors and lobbies.
  - 4. Uncoated Steel Sheet for Door: Nominal 0.060 inch (1.52 mm), 16 gage, factory primed.
  - 5. Lock: Prepared for mortise cylinder.
- C. Fire-Rated Access Doors And Frames
- 1. Manufacturer shall be the same as selected in section A.
  - 2. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with concealed flange for gypsum board installation, self-closing door, and concealed hinge.
  - 3. Locations: Wall and ceiling.
  - 4. Steel Sheet for Door: 12 gage, Stainless Steel, Type 304, No. 4 Finish.
  - 5. Frame Material: 12 gage, Stainless Steel, Type 304, No. 4 Finish.
  - 6. Anchors: Heavy steel, welded to frame.
  - 7. Lock: Counter sunk, tamperproof screws
  - 8. Sizes: As indicated on Drawings.

## 2.3 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- D. Frame Anchors: Same material as door face.
- E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

## 2.4 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
  - 1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling. Provide access sleeves for each latch operator and install in holes cut through finish.
- E. Latch and Lock Hardware:
  - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
  - 2. Keys: Furnish two keys per lock and key all locks alike.
  - 3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."

## 2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
  - 2. Finish all surfaces of trim and frame.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

### 3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083113

## 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. Sliding doors.
  - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
  - 1. Mechanical door hardware.
  - 2. Electromechanical door hardware.
  - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
  - 1. Division 08 Section "Hollow Metal Doors and Frames".
  - 2. Division 08 Section "Flush Wood Doors".
  - 3. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
  - 4. Division 28 Section "Access Control Hardware Devices".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - 2. ICC/IBC - International Building Code.
  - 3. NFPA 70 - National Electrical Code.
  - 4. NFPA 80 - Fire Doors and Windows.
  - 5. NFPA 101 - Life Safety Code.
  - 6. NFPA 105 - Installation of Smoke Door Assemblies.
  - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
  - 1. ANSI/BHMA Certified Product Standards - A156 Series.

2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

### 1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
    - h. Warranty information for each product.
  4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
  1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:



- a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
  - b. Complete (risers, point-to-point) access control system block wiring diagrams.
  - c. Wiring instructions for each electronic component scheduled herein.
2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
  1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

#### 1.4 CLOSEOUT SUBMITTALS

- A. 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.
- B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the

manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

- E. 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.
- F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
  - 1. Function of building, purpose of each area and degree of security required.
  - 2. Plans for existing and future key system expansion.
  - 3. Requirements for key control storage and software.
  - 4. Installation of permanent keys, cylinder cores and software.
  - 5. Address and requirements for delivery of keys.
- H. 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
- I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

## 1.6 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".

## 1.7 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.

## 1.8 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. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

## 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 MATERIALS

- A. Hardware shall not have any visible manufacturer names on exposed materials when the door is in a closed position.

### 2.3 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
  - 1. Quantity: Provide the following hinge quantity:
    - a. Two Hinges: For doors with heights up to 60 inches.
    - b. Three Hinges: For doors with heights 61 to 90 inches.
    - c. Four Hinges: For doors with heights 91 to 120 inches.
    - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
  - 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
    - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
    - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
  - 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
    - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.

- b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
- 4. Hinge Options: Comply with the following:
  - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.
- 5. Manufacturers:
  - a. McKinney (MK) - TA/T4A Series, 5-knuckle.

## 2.4 POWER TRANSFER DEVICES

- A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
  - 1. Manufacturers:
    - a. Pemko (PE) - EL-CEPT Series.
    - b. Securitron (SU) - EL-CEPT Series.
- B. 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 (MK) - Electrical Connecting Kit: QC-R001.
    - b. McKinney (MK) - Connector Hand Tool: QC-R003.
  - 2. Manufacturers:
    - a. McKinney (MK) - QC-C Series.

## 2.5 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

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 (RO).
- B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.
1. Manufacturers:
    - a. Rockwood (RO).
- C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units 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. Pulls, where applicable, shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
  5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
  6. Manufacturers:
    - a. Rockwood (RO).

## 2.6 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.
1. Manufacturers:
    - a. dormakaba BEST (BE).
    - b. Sargent Manufacturing (SA).
    - c. Schlage (SC).

- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
1. Threaded mortise cylinders with rings and cams to suit hardware application.
  2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
  4. Tubular deadlocks and other auxiliary locks.
  5. 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.
  6. Keyway: Match Facility Standard.
- C. Keying System: Each type of lock and cylinders to be factory keyed.
1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
  2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
  3. Existing System: Field verify and key cylinders to match Owner's existing system.
- D. 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).
- E. Construction Keying: Provide construction master keyed cylinders.
- F. Key Registration List (Bitting List):
1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
  2. Provide transcript list in writing or electronic file as directed by the Owner.

## 2.7 MORTISE LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational and Security Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.
1. Provide locksets with functions and features as follows:
    - a. Heavy duty 12-gauge wrought steel case.
    - b. Stainless steel 3/4" one-piece anti-friction reversible latchbolt with a one-piece hardened stainless steel 1" projection deadbolt.
    - c. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
    - d. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.

- e. Meets UL Certification Directory ZHLL.R21744 for products used in windstorm rated assemblies.
  - f. Status indicators inside, outside, or on both sides of doors as specified; available with wording for “locked/unlocked”, “vacant/occupied” or custom wording options. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status.
  - g. Ten-year limited warranty for mechanical functions.
2. Manufacturers:
- a. Corbin Russwin Hardware (RU) - ML2000 Series.
  - b. dormakaba BEST (BE) - 45H Series.
  - c. Sargent Manufacturing (SA) - 8200 Series.
  - d. Schlage (SC) - L9000 Series.

## 2.8 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.

## 2.9 SURFACE DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
- 1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
  - 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
  - 3. Cycle Testing: Provide closers which have surpassed 15 million cycles.
  - 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 Americans with Disabilities Act, 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 (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Large body cast iron surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:
  - a. Corbin Russwin Hardware (RU) - DC8000 Series.
  - b. LCN Closers (LC) - 4040XP Series.
  - c. Sargent Manufacturing (SA) - 281 Series.

## 2.10 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 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 (RO).

## 2.11 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 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 (RO).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
  - 1. Manufacturers:
    - a. Norton Rixson (RF).
    - b. Sargent Manufacturing (SA).

## 2.12 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 (PE).

## 2.13 ELECTRONIC ACCESSORIES

- A. Switching Power Supplies: Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

- 1. Power supplies shall meet all functions and features as specified herein.
    - a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.
    - b. Tolerates brownout or overvoltage input  $\pm 15\%$  of nominal voltage.
    - c. Thermal shutdown protection with auto restart.
    - d. Circuit breaker protection against overcurrent and reverse battery faults.
    - e. Integrated battery charging circuit to prevent overvoltage on locking devices.
    - f. Available with a single relay fire trigger or individually triggered relayed outputs.
    - g. Monitoring options as specified.

- 2. Manufacturers:

- a. Altronix (AS) - Maximal 3.
    - b. Life Safety Power (LP).
    - c. Securitron (SU) - AQD Series.
    - d. No Substitution.

- B. Intelligent Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

- 1. Power supplies shall meet all functions and features as specified herein.
    - a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.
    - b. Dedicated fast charger to prolong battery life with low battery cutoff to protect batteries from deep discharge.
    - c. Enhanced surge immunity for input/output protection
    - d. Separate, dedicated battery charging circuit to keep locks cooler.
    - e. Dual-color LED visual notification to prevent applying incorrect voltages to the power supply.
    - f. Instant auto-switch to battery on AC loss.
    - g. Expandable up to 16 outputs in the standard enclosure
    - h. Integrated fire alarm interface to allow main output shutdown or disconnect on a per output basis when using an R8 output module.
    - i. Network ready and remotely manage locks and connected devices when using an M8 managed output module on network models.

- j. Lifetime replacement, no-fault, no questions asked warranty.

2. Manufacturers:

- a. Altronix (AS) – Maximal 11F.
- b. Life Safety Power (LP).
- c. Securitron (SU) - AQL Series.
- d. No Substitution.

2.14 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.

2.15 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. DHI TDH-007-20: Installation Guide for Doors and Hardware.
  - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
  - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
- 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 Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
  - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

### 3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

### 3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

### 3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
  - 1. Quantities listed are for each pair of doors, or for each single door.
  - 2. The supplier is responsible for handing and sizing all products.
  - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
  - 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION 087100

## SECTION 088000 - GLAZING

### 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. Glass for windows, doors.

#### 1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.

#### 1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

#### 1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 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 temporary protection requirements for glazing during and after installation.

#### 1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.

- C. Glazing Accessory Samples: For sealants, in 12-inch (300-mm) lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

## 1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For glass.
- C. Preconstruction adhesion and compatibility test report.
- D. Sample Warranties: For special warranties.

## 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

## 1.10 FIELD 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.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cardinal Glass Industries.
  - 2. Guardian Industries Corp.
  - 3. JE Berkowitz, LP.
  - 4. Oldcastle BuildingEnvelope.
  - 5. Pilkington North America.



6. PPG Flat Glass; PPG Industries, Inc.
7. Viracon, Inc.

- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

## 2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
- C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- D. Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
  1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.

## 2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

## 2.4 GLASS PRODUCTS

- A. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

## 2.5 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

## 2.6 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  - 2. Minimum required face and edge clearances.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- D. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- E. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- F. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- G. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

### 3.4 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

### 3.5 MONOLITHIC GLASS SCHEDULE

#### A. Glass Type G1: Clear fully tempered float glass.

1. Uncoated Clear Fully Tempered Float Glass G1. Kind: FT (fully tempered).
2. Glass: Clear float glass.
3. Safety glazing required.
4. 1/4 inch thick.

END OF SECTION 088000

## SECTION 092216 - NON-STRUCTURAL METAL FRAMING

### 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. Non-load-bearing steel framing systems for interior partitions.
  - 2. Suspension systems for interior ceilings and soffits.
  - 3. Grid suspension systems for gypsum board ceilings.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Studs and Runners: Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members."

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For embossed steel studs and runners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Horizontal Deflection: For wall assemblies, limited to 1/360 of the wall height based on horizontal loading of 5 lbf/sq. ft. (239 Pa).

## 2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
  - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
  - 2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.
- B. Studs and Tracks: ASTM C 645.
  - 1. Steel Studs and Tracks:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) CEMCO; California Expanded Metal Products Co.
      - 2) ClarkDietrich
      - 3) MarinoWARE
      - 4) SCAFCO
    - b. Minimum Base-Metal Thickness: 362S200-33, 0.0329 inch (20 GA Structural/33 Mils).
    - c. Depth: As indicated on Drawings.
  - 2. "EQ" (Equivalent Gauge Thickness) Steel Studs and Runners: Members that can show certified third party testing with gypsum board in accordance with ICC ES AC86 (Approved May 2012) need not meet the minimum thickness limitation or minimum section properties set forth in ASTM C 645. The submission of an evaluation report is acceptable to show conformance to this requirement.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) CEMCO; California Expanded Metal Products Co. Does not meet limiting height requirements.
      - 2) ClarkDietrich. ProSTUD 30MIL (0.0312 inches thick)
      - 3) MarinoWARE. Does not meet limiting height requirements.
      - 4) SCAFCO. Does not meet limiting height requirements
- C. Slip-Type Head Joints: Where indicated, provide the following:
  - 1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
    - a. Gauge: Deflection track to be minimum 18 gauge or two gauges thicker than studs, whichever is greater.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
  - 1. Minimum Base-Metal Thickness: 0.0329 inch (0.836 mm).
- E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0296 inch (0.752 mm).
2. Depth: 7/8 inch (22.2 mm).

- F. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.0179 inch (0.455 mm), and depth required to fit insulation thickness indicated.

## 2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
- B. Hanger Attachments to Concrete:
1. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
- D. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

## 2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide the following:
1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

#### A. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

### 3.3 INSTALLATION, GENERAL

#### A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. 16 inches (406 mm) o.c. unless otherwise indicated.

- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.



2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
  4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
  5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

### 3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
1. Hangers: 48 inches (1219 mm) o.c.
  2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
  3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

- a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
- 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
- 4. Do not attach hangers to steel roof deck; permanent metal forms; rolled-in hanger tabs of composite steel floor deck.
- 5. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

## SECTION 092900 - GYPSUM BOARD

### 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 gypsum board.
- 2. Tile backing panels.

- B. Related Requirements:

- 1. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
- 2. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
- 3. Section 093013 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.
- 4. Section 101420 "Code Required Signage" for Barrier Identification.

#### 1.3 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- (300-mm-) long length for each trim accessory indicated.

#### 1.4 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.

#### 1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, 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, 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.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

### 2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

### 2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard: ASTM C 1396/C 1396M.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Continental Building Products, LLC.
    - b. Georgia-Pacific Building Products.
    - c. National Gypsum Company.
    - d. United States Gypsum Company.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
  - 1. Thickness: 5/8 inch (15.9 mm).
  - 2. Long Edges: Tapered.
  - 3. Application: Walls, ceilings and soffits, typical.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
  - 1. Thickness: 5/8 inch (15.9 mm).
  - 2. Long Edges: Tapered.
  - 3. Application: Fire rated walls, ceilings and soffits, typical.
- D. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. National Gypsum Company. Gold Bond XP (with Sporgard). No exceptions.
2. Core: 5/8 inch (15.9 mm), Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

## 2.4 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed Corporation. Diamondback Tile Backer
    - b. James Hardie Building Products, Inc. HardieBacker Cement Board
    - c. National Gypsum Company. Permabase Cement Board
    - d. United States Gypsum Company. Durock Cement Board
  2. Thickness: 5/8 inch (15.9 mm).
  3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

## 2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
1. Material: Plastic.
  2. Shapes:
    - a. Cornerbead.
    - b. Expansion (control) joint.
    - c. Partition End Cap: Where partitions intersect mullions.
  3. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable manufacturer and product:
    - a. Certainteed.
    - b. Drywall Trims
    - c. Plastic Components.
    - d. Trim-Tex.
    - e. Vinyl Corp., a Division of ClarkDietrich
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Fry Reglet Corporation.
    - b. Gordon, Inc.
    - c. Pittcon Industries.

2. Shapes:
  - a. Cornerbead.
  - b. Reveal Molding: Size and location as indicated on drawings.
  - c. Partition End Cap: Where partitions intersect mullions.
  - d. Other shapes: As indicated on Drawings.
3. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
4. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

## 2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  1. Interior Gypsum Board: Paper.
  2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
  3. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
  1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
    - a. Use setting-type compound for installing paper-faced metal trim accessories.
  3. Fill Coat: For second coat, use drying-type, all-purpose compound.
  4. Finish Coat: For third coat, use setting-type, sandable topping compound.
  5. Skim Coat: For final coat of Level 5 finish, use high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
- D. Joint Compound for Tile Backing Panels:
  1. Cementitious Backer Units: As recommended by backer unit manufacturer.

## 2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- 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 (0.84 to 2.84 mm) 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; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."
- F. Partition End Cap: Where partitions intersect mullions and/or exterior glazing.
1. Mullion Mate Snap Extruded Aluminum Partition Gap Closures are pre-assembled, and spring loaded to provide a tight fit for vertical junctures of partitions and window walls.
  2. Model to be selected based on partition thickness.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- 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.

### 3.2 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 (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.

- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions 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.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Wallboard Type: Vertical surfaces and ceiling surfaces unless otherwise indicated.
  - 2. Type X: Vertical surfaces and ceiling surfaces of fire rated construction unless otherwise indicated.
  - 3. Mold-Resistant Type: Interior partitions where water is present, excluding toilets and janitor closets.
- 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-shaped 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 (400 mm)** minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped 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.

- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

### 3.4 APPLYING TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at showers, tubs, and where indicated.
- B. Mold-Resistant Gypsum Board: All other wet areas not scheduled to receive tile, including, but not limited to, hand sinks and water fountains.
- C. Water-Resistant Backing Board: Install where indicated with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- D. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

### 3.5 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.
  2. Bullnose Bead: Use at outside corners.
  3. LC-Bead: Use at exposed panel edges.
  4. Partition End Caps: Use where partitions intersect mullions.

- D. Exterior Trim: Install in the following locations:
  - 1. Cornerbead: Use at outside corners.
  - 2. LC-Bead: Use at exposed panel edges.
- E. Aluminum Trim: Install in locations indicated on Drawings.
- F. Partition End Cap: Install with Neoprene pad between trim and mullion. Caulk both sides.

### 3.6 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 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, General: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 2: Panels that are substrate for tile.
  - 2. Level 3: Ceiling plenum areas, concealed areas, and where indicated.
  - 3. 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."
  - 4. Level 5: At all public corridors and lobbies, interior partitions where wall wash style lighting illuminates the wall, or is adjacent to exterior natural lighting sources. At all unobstructed 50 foot continuous lengths of wall/partition surface.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.
- F. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, finish in accordance to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- G. STC-Rated Assemblies: For STC-rated assemblies, finish in accordance to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

### 3.7 INSTALLING PARTITION END CAPS

- A. Extruded Aluminum Partition Gap Closures shall be inspected before installation to be free from dents, scratches, and other defects.
- B. Install in accordance with Manufacturer's written Installation Instructions and Details.

- C. Space Enclosure: Do not install any work until space is enclosed and weatherproofed, wet-work in space is completed and nominally dry, work above ceilings is complete, and temperature and humidity shall be continuously maintained at values near those of final occupancy

### 3.8 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

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## SECTION 095123 - ACOUSTICAL TILE CEILINGS

### 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. Acoustical tiles for interior ceilings.
  - 2. Fully concealed, direct-hung, suspension systems.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) in size if product is other than Basis of Design product.
- C. Samples for Verification: Contractor shall retain on site as a record of selected materials. The Architect does not require samples for basis of design products to be submitted for review. For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
  - 1. Acoustical Tiles: Set of full-size Samples of each type, color, pattern, and texture.
  - 2. Concealed Suspension-System Members: 6-inch- (150-mm-) long Sample of each type.
  - 3. Exposed Moldings and Trim: Set of 6-inch- (150-mm-) long Samples of each type and color.
  - 4. Seismic Clips: Full size.
- D. Delegated-Design Submittal: For seismic restraints for ceiling systems.
  - 1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.
2. Structural members to which suspension systems will be attached.
3. Method of attaching hangers to building structure.
4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
5. Size and location of initial access modules for acoustical tile.
6. Items penetrating finished ceiling and ceiling-mounted items including the following:
  - a. Lighting fixtures.
  - b. Diffusers.
  - c. Grilles.
  - d. Speakers.
  - e. Sprinklers.
  - f. Access panels.
  - g. Perimeter moldings.
  - h. Laboratory curtains.
7. Show operation of hinged and sliding components adjacent to acoustical tiles.
8. Minimum Drawing Scale: 1/4 inch = 1 foot (1:48).

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical tile ceiling, for tests performed by a qualified testing agency.

D. Evaluation Reports: For each acoustical tile ceiling suspension system and anchor and fastener type, from ICC-ES.

## 1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

## 1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size tiles equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each concealed grid and exposed component equal to 2 percent of quantity installed.

## 1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

## 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations:
  - 1. Suspended Acoustical Tile Ceilings: Obtain each type of acoustical ceiling tile and its suspension system from single source from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints for ceiling systems.
- B. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Class A according to ASTM E 1264.
  - 2. Smoke-Developed Index: 50 or less.

### 2.3 ACOUSTICAL TILES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Armstrong World Industries, Inc.
  - 2. Life Science Products.
  - 3. United States Gypsum Company.
- B. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide tiles as follows:
  - 1. Refer to Drawings for Basis of Design products.
- D. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no

mold, mildew, or bacterial growth when tested according to ASTM D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

## 2.4 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Armstrong World Industries, Inc.
  - 2. United States Gypsum Company.
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, fully concealed, metal suspension system and accessories of type, structural classification, and finish indicated that complies with applicable requirements in ASTM C 635/C 635M.
- C. Refer to Drawings for Basis of Design products.

## 2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
  - 1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to **[10] <Insert safety factor>** times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
  - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  - 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- (2.69-mm-) diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.
- F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate lateral forces.
- H. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical tiles in-place during a seismic event.



## 2.6 ACOUSTICAL SEALANT

- A. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

### 3.3 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

- A. Install suspended acoustical tile ceilings according to ASTM C 636/C 636M, seismic design requirements, and manufacturer's written instructions.
- B. Suspend ceiling hangers from building's structural members and as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger

- involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  8. Do not attach hangers to steel deck tabs.
  9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
  11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical tiles.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends. Miter corners accurately and connect securely.
  3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension-system flanges into kerfed edges of tiles so tile-to-tile joints are interlocked.
1. Fit adjoining tiles to form flush, tight joints. Scribe and cut tiles for accurate fit at borders and around penetrations through ceiling.
  2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tiles and moldings, spaced 12 inches (305 mm) o.c.
- 3.4 REMOVAL AND REINSTALLATION OF EXISTING ACOUSTICAL CEILINGS
- A. Where required by the work of new construction, remove existing acoustical ceilings, including suspension system, as required for completion of the new work.
- B. Remove only that portion of the acoustical materials and suspension system as is necessary for the required work. Coordinate with all trades to determine the extent of the area to be removed. Store materials in a neat manner and protect from damage.
- C. After all associated trade work has been completed, reinstall the existing ceiling materials.

### 3.5 PATCHING OF EXISTING AREAS

- A. Patch and match existing acoustical ceilings in existing areas disturbed by the new construction. Where acoustical tiles and suspension system have been removed because of new construction and cannot be reinstalled install new material to match the existing. Materials to be used for patching and matching shall be approved by the Architect. The installer shall visit the site, acquaint himself with the types of existing ceiling materials and the extent of replacement.

### 3.6 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.
- B. Directly Attached Ceilings: Install bottom surface of tiles to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m) and not exceeding 1/4 inch (6 mm) cumulatively.
- C. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m), non-cumulative.

### 3.7 ADJUSTING

- A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095123

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## SECTION 096513 - RESILIENT BASE AND ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Work Results:

1. Provide resilient base and accessories where indicated on the drawings.

B. Principal Products:

1. Resilient base.
2. Resilient molding accessories.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

#### 1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

#### 1.4 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.

#### 1.5 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.

## 1.6 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 VINYL BASE

- A. Refer to Finish Legend on Drawings for Manufacturer's, materials, colors and patterns.
- B. Product Standard: ASTM F1861, Type TV (vinyl, thermoplastic).
  - 1. Group: I (solid, homogeneous).
  - 2. Style: Cove (base with extended toe).
- C. Minimum Thickness: 0.080 inch.
- D. Height: 4 inches.
- E. Lengths: 100 feet roll goods, minimum cut.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.

### 2.2 VINYL MOLDING ACCESSORY

- A. Refer to Finish Legend on Drawings for Manufacturer's, materials, colors and patterns.
- B. Description: As per Product designation as indicated on Drawings.
- C. Profile and Dimensions: As indicated on Drawings.
- D. Locations: Provide vinyl molding accessories in areas indicated.
- E. Colors and Patterns: As indicated on Drawings.

### 2.3 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.

## 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. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are the same temperature as the space where they are to be installed.
  - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

### 3.3 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. Job-Formed Corners:
  - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 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 3 inches 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 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.
- 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. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513



## SECTION 096519 - RESILIENT TILE FLOORING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Work Results:

1. Provide resilient tile flooring where indicated on the drawings.

B. Principal Products:

1. Luxury vinyl tile.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.

C. Samples: Full-size units of each color and pattern of floor tile required.

1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.

D. Product Schedule: For floor tile. Use same designations indicated on Drawings.

E. Qualification Data: For Installer.

#### 1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

#### 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. Floor Tile: Furnish one box for every boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

#### 1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are

competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockups for floor tile including resilient base and accessories.
    - a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations indicated.
  - 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.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 55 deg F or more than 85 deg F. Store floor tiles on flat surfaces.

## 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 floor tile 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. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

## 2.2 LUXURY VINYL FLOOR TILE

- A. Refer to Finish Legend on Drawings for Manufacturer's, materials, colors and patterns.
- B. Tile Standard: ASTM F 1700, Class III, Type B.
- C. Thickness: 0.125 inch.
- D. Size: 36 by 36 inches.

## 2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type clear set adhesive recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Adhesives: As recommended by Manufacturer to meet site conditions.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile 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 floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare 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 floor tile manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
  - 4. Moisture Testing: Refer to Section 090512 "Concrete Floor Moisture Content and pH Testing."

- 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 floor tiles 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 floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.
- F. Prepare substrates according to Manufacturer's written instructions to ensure adhesion of Resilient Tile Flooring.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate paint, coatings and other substances that are incompatible with adhesives or contain soap, wax, oil, solvents, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
  - 3. Mechanically remove contamination on the substrate that may cause damage to the resilient flooring material. Permanent and non-permanent markers, pens, crayons, paint, etc., must not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.
  - 4. Prepare Substrates according to ASTM F 710 including the following:
    - a. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
    - b. Perform anhydrous calcium chloride test, ASTM F 1869. Results must not exceed 5 lbs. Moisture Vapor Emission Rate per 1,000 sq. ft. in 24 hours.
    - c. Perform relative humidity test using in situ probes, ASTM F 2170. Results must not exceed 80%.
    - d. A pH test for alkalinity must be conducted. Results should range between 7 and 9. If the test results are not within the acceptable range of 7 to 9, the installation must not proceed until the problem has been corrected.
    - e. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
    - f. Wood subfloors must have a minimum 18" (45.7 cm) of cross-ventilated space beneath the bottom of the joist.
    - g. The floor must be rigid, free of movement.
    - h. Single wood and tongue and groove subfloors should be covered with ¼" (6.4 mm) or ½" (12.7 mm) APA approved underlayment plywood.
    - i. Use ¼" (6.4 mm) thick underlayment panels for boards with a face width of 3" (76 mm) or less.

- j. Use ½" (12.7 mm) thick underlayment panels for boards with a face width wider than 3" (76 mm).
- k. Do not install over OSB (Oriented Strand Board), particle board, chipboard, lauan or composite type underlayments.
- l. Fill cracks, holes, depressions and irregularities in the substrate with good quality Portland cement based underlayment leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- m. Floor covering shall not be installed over expansion joints.
- n. Do not install resilient products until they are same temperature as the space where they are to be installed.
- o. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- p. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

### 3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  - 1. Lay tiles pattern indicated on Drawings.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
  - 1. Lay tiles with grain running in one direction in the length of the room, unless otherwise noted on the finish drawings.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

#### 3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
  - 1. Apply two coat(s).
- E. Cover floor tile until Substantial Completion.
  - 1. No traffic for 24 hours after installation.
  - 2. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.
  - 3. Cover resilient products until Substantial Completion.
  - 4. Wait 72 hours after installation before performing initial cleaning.
  - 5. A regular maintenance program must be started after the initial cleaning.

END OF SECTION 096519

## SECTION 096813 - TILE CARPETING

### 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 modular carpet tile.
- B. Related Requirements:
  - 1. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
    - a. Review delivery, storage, and handling procedures.
    - b. Review ambient conditions and ventilation procedures.
    - c. Review subfloor preparation procedures.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
  - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. Shop Drawings: For carpet tile installation, plans showing the following:
  - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
  - 2. Carpet tile type, color, and dye lot.
  - 3. Type of subfloor.
  - 4. Type of installation.
  - 5. Pattern of installation.
  - 6. Pattern type, location, and direction.
  - 7. Pile direction.
  - 8. Type, color, and location of insets and borders.

9. Type, color, and location of edge, transition, and other accessory strips.
  10. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet Tile: Full-size Sample.
  2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.
- D. Samples for Initial Selection: For each type of carpet tile.
1. Include Samples of exposed edge, transition, and other accessory stripping involving color or finish selection.
- E. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet Tile: Full-size Sample.
  2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.
- F. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
  1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
  2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

#### 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).



## 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI's "CRI Carpet Installation Standard."

## 1.10 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

## 1.11 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
  - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
  - 2. Failures include, but are not limited to, the following:
    - a. More than 10 percent edge raveling, snags, and runs.
    - b. Dimensional instability.
    - c. Excess static discharge.
    - d. Loss of tuft-bind strength.
    - e. Loss of face fiber.
    - f. Delamination.
  - 3. Warranty Period: [10] years from date of Final Completion.

## PART 2 - PRODUCTS

### 2.1 CARPET TILE

- A. Manufacturers: Refer to Finish Legend indicated on Drawings.

- B. Color and Pattern: Refer to Finish Legend indicated on Drawings.
- C. Applied Treatments:
  - 1. Applied Soil-Resistance Treatment: Manufacturer's standard material.
  - 2. Antimicrobial Treatment: Manufacturer's standard material.
    - a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.
- D. Primary Backing/Backcoating: Manufacturer's standard composite materials.
- E. Secondary Backing: Manufacturer's standard material.
- F. Size: Refer to Finish Legend indicated on Drawings.

## 2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.
- C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
  - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

- a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
  - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
  - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
- D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

### 3.3 INSTALLATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns indicated on Drawings.
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.

### 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
  - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
  - 2. Remove yarns that protrude from carpet tile surface.
  - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

## SECTION 099123 - INTERIOR PAINTING

### 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 surface preparation and the application of paint systems on interior substrates.
- B. Related Requirements:
  - 1. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
  - 2. Section 101420 "Code Required Signage" for Barrier Identification.

#### 1.3 DEFINITIONS

- A. MPI Gloss Level 1 (Matte Finish – Flat): Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 2 (High Side Sheen Flat "Velvet"): Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 3 (Eggshell): 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 4 (Satin): 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. MPI Gloss Level 5 (Semi-Gloss): 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 6 (Traditional Gloss): 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. MPI Gloss Level 7 (High Gloss): More than 85 units at 60 degrees, according to ASTM D 523.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
  - 2. Indicate VOC content.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.
5. Samples must be dried for a minimum of seven days prior to submission to Architect.

- C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

## 1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Sherwin-Williams Company (The) or approved equal.

- B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Interior Painting Schedule for the paint category indicated.

## 2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors: As indicated in the finish schedule.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
  2. Fiber-Cement Board: 12 percent.
  3. Masonry (Clay and CMUs): 12 percent.
  4. Wood: 15 percent.
  5. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

#### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
  1. SSPC-SP 3.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
  1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  2. Sand surfaces that will be exposed to view, and dust off.
  3. Prime edges, ends, faces, undersides, and backsides of wood.
  4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
  1. Use applicators and techniques suited for paint and substrate indicated.
  2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.



- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
  - 1. Paint the following work where exposed in occupied spaces:
    - a. Equipment, including panelboards.
    - b. Uninsulated metal piping.
    - c. Uninsulated plastic piping.
    - d. Pipe hangers and supports.
    - e. Metal conduit.
    - f. Plastic conduit.
    - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
    - h. Other items as directed by Architect.
  - 2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

### 3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
  - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
  - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

### 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.6 INTERIOR PAINTING SCHEDULE

#### A. Concrete Substrates, Nontraffic Surfaces:

##### 1. High-Performance Architectural Latex System:

- a. Prime Coat: Primer, alkali resistant, water based, MPI #3.

- ~~1) Benjamin Moore & Co. Ultra Spec Interior/Exterior Acrylic High-Build Masonry Primer~~
- 2) PPG Paints. Seal Grip Acrylic Universal Primer 17-921XI
- 3) Sherwin-Williams Company (The). Loxon Concrete and Masonry Primer

- b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.

- c. Topcoat: Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #141.

- 1) Benjamin Moore & Co. Ultra Spec 500 Waterborne Interior Gloss
- 2) Cloverdale Paint. Performance Plus High Performance Ultra Low VOC Ecologic Waterborne GL5 Semi-Gloss White
- 3) PPG Paints. Manor Hall Interior 100% Acrylic Semi-Gloss Latex 82-500

#### B. CMU Substrates:

##### 1. High-Performance Architectural Latex System:

- a. Block Filler: Block filler, latex, interior/exterior, MPI #4.

- ~~1) Benjamin Moore & Co. Super Kote 5000 Latex Production Block Filler Flat~~
- ~~2) Cloverdale Paint. Int/Ext Latex Block Filler~~
- ~~3) PPG Paints. Speedhide Hi Fill Int/Ext Latex Block Filler 6-15XI~~
- 4) Sherwin-Williams Company (The). Heavy Duty Block Filler

- b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.

- c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.

- ~~1) Benjamin Moore & Co. Ultra Spec 500 Waterborne Interior Eggshell~~
- ~~2) PPG Paints. Manor Hall Interior 100% Acrylic Satin Latex 82-400~~
- 3) Sherwin-Williams Company (The). Emerald Interior Acrylic Latex Satin

##### 2. Alkyd System MPI INT 4.2N:

- a. Block Filler: Block filler, latex, interior/exterior, MPI #4.

- ~~1) Benjamin Moore & Co. Super Kote 5000 Latex Production Block Filler Flat~~
- ~~2) Cloverdale Paint. Int/Ext Latex Block Filler~~
- ~~3) PPG Paints. Speedhide Hi Fill Int/Ext Latex Block Filler 6-15XI~~
- 4) Sherwin-Williams Company (The). Heavy Duty Block Filler

- b. Intermediate Coat: Alkyd, interior, matching topcoat.
- c. Topcoat: Alkyd, interior (MPI Gloss Level 3), MPI #51.
  - 1) Samhwa Paint: MPI 51 Enamel AE

C. Steel Substrates (hollow metal):

- 1. Latex over Shop-Applied Quick-Drying Shop Primer System MPI INT 5.1X:
  - a. Prime Coat: Primer, quick dry, for shop application, MPI #275.
    - 1) Coordinate with hollow metal fabricator.
  - b. Intermediate Coat: Latex, interior, matching topcoat.
  - c. Topcoat: Latex, interior (MPI Gloss Level 4), MPI #43.
    - 1) ~~Benjamin Moore & Co. Ultra Spec 500~~
    - 2) ~~PPG Paints. Hi-Hide Satin Interior Latex Paint 379-10 Series~~
    - 3) Sherwin-Williams Company (The). ProMar 400 Zero VOC Semi-Gloss

D. Wood Substrates (use at backing boards for telecom room):

- 1. Latex over Alkyd Primer System MPI INT 6.2A:
  - a. Prime Coat: Primer sealer, alkyd, interior, MPI #45.
    - 1) ~~Benjamin Moore & Co. Super Spec Alkyd Enamel Undercoater & Primer Sealer~~
    - 2) ~~PPG Paints Seal Grip Alkyd Universal Primer 17-941NF~~
    - 3) Sherwin-Williams Company (The). ProBlock Interior Oil-Based Primer
  - b. Intermediate Coat: Latex, interior, matching topcoat.
  - c. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.
    - 1) ~~Benjamin Moore & Co. Ultra Spec 500 Interior Flat Finish~~
    - 2) ~~PPG Paints. Speedhide zero Interior Zero VOC Latex Flat 6-4110XI~~
    - 3) Sherwin-Williams Company (The). ProMar 200 Zero VOC Interior Latex Flat

E. Gypsum Board Substrates:

- 1. Latex over Latex Sealer System (Use typically at ceilings and soffits):
  - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
    - 1) ~~Benjamin Moore & Co. Super Spec Premium Interior Latex Primer Primer~~
    - 2) ~~PPG Paints. Speedhide zero Interior Zero VOC Latex Primer 6-4900XI~~
    - 3) Sherwin-Williams Company (The). ProMar 200 Zero Interior Latex Primer
  - b. Intermediate Coat: Latex, interior, matching topcoat.
  - c. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.

- ~~1) Benjamin Moore & Co. Ultra Spec 500 Interior Flat Finish~~
    - ~~2) PPG Paints. Speedhide zero Interior Zero VOC Latex Flat 6-4110XI~~
    - 3) Sherwin-Williams Company (The). ProMar 200 Zero VOC Interior Latex Flat
2. High-Performance Architectural Latex System MPI INT 9.2B (Use typically on walls):
  - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
    - ~~1) Benjamin Moore & Co. Super Spec Premium Interior Latex Primer Primer~~
    - ~~2) PPG Paints. Speedhide zero Interior Zero VOC Latex Primer 6-4900XI~~
    - 3) Sherwin-Williams Company (The). ProMar 200 Zero Interior Latex Primer
  - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
  - c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.
    - ~~1) Benjamin Moore & Co. Ultra Spec 500 Waterborne Interior Eggshell~~
    - ~~2) PPG Paints. Manor Hall Interior 100% Acrylic Satin Latex 82-400~~
    - 3) Sherwin-Williams Company (The). Emerald Interior Acrylic Latex Satin
3. Alkyd over Latex Sealer System MPI INT 9.2C (use at laboratories, clean rooms, food prep):
  - a. Prime Coat: Primer sealer, latex, interior, MPI #45.
    - ~~1) Benjamin Moore & Co. Super Spec Alkyd Enamel Undercoater & Primer Sealer~~
    - ~~2) PPG Paints. Seal Grip Alkyd Universal Primer 17-941NE~~
    - 3) Sherwin-Williams Company (The). ProBlock Interior Oil-Based Primer
  - b. Intermediate Coat: Alkyd, interior, matching topcoat.
  - c. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47.
    - ~~1) Benjamin Moore & Co. Super Spec Alkyd Semi-Gloss Enamel~~
    - ~~2) PPG Paints. Glyptex Interior Alkyd Enamel Semi-Gloss 439-10 Series~~
    - 3) Sherwin-Williams Company (The). ProMar 200 Alkyd Semi-Gloss

END OF SECTION 099123

## SECTION 101420 – CODE REQUIRED SIGNAGE

### 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. Barrier Identification.

- B. Related Requirements:

- 1. Section 078413 "Penetration Firestopping" for tagging and identification of UL rated penetrations.
  - 2. Section 078443 "Joint Firestopping" for tagging and identification of UL rated joint assemblies.

#### 1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

#### 1.4 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: For panel signs.

- 1. Include fabrication and installation details and attachments to other work.
  - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
  - 3. Show message list, type styles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
- E. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Sample Warranty: For special warranty.

## 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

## 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer of products.

## 1.9 FIELD CONDITIONS

- A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

## 1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Deterioration of finishes beyond normal weathering.
    - b. Deterioration of embedded graphic image.
    - c. Separation or delamination of sheet materials and components.
  - 2. Warranty Period: Five years from date of Final Completion.

## PART 2 - PRODUCTS

### 2.1 PANEL SIGNS, GENERAL

- A. Regional Materials: Panel signs shall be manufactured within 500 miles (800 km) of Project site.

- B. Contractor shall engage the owners' vendor Interface Architectural Signs. Contact: Mark Hester mhester@innerfacesign.com.

## 2.2 BARRIER IDENTIFICATION

- A. Where there is an accessible concealed floor, floor-ceiling or attic space, fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling in the concealed space.
  - 1. Identifications shall be located within 15 feet of the end of each wall and at intervals not exceeding 30 feet measured horizontally along the wall or partition.
    - a. Additional identification may be required based on visibility within the concealed space.
  - 2. Letters shall be 3 inches high minimum with a 3/8 inch stroke in a contrasting colour incorporating the suggested wording, "FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS," or other wording.

## 2.3 ACCESSORIES

- A. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch (1.14 mm) thick, with adhesive on both sides.

## 2.4 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
  - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
  - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
  - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Mounting Methods: (Both methods are to be used on each sign)
  - 1. Two-Face Tape: 4950 Foam Tape as manufactured by 3M.
  - 2. Adhesive: 1201 as manufactured by General Electric, 732 as manufactured by Dow Corning, or equal.

### 3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

## PART 4 - SCHEDULE

- 4.1 The list below is not intended to be inclusive of all code required signage, but rather a guide to help determine the full extent as required by Code.
  - A. Identification of stair and stair number located on the push and pull side of the door.
  - B. Signs to restrooms, including gender and accessibility pictographs.
  - C. Signs to Mechanical and Electrical room.
  - D. Signs to Janitor Closets.
  - E. Barrier Identification.

END OF SECTION 101420



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## SECTION 102600 - WALL PROTECTION

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Work Results:

1. Provide wall protection where indicated on the drawings.

B. Principal Products:

1. Corner guards.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: Include construction details, material descriptions, impact strength, fire-test- response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.

- B. Shop Drawings: For each impact-resistant wall protection unit showing locations and extent. Include sections, details, and attachments to other work.

- C. Samples: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Corner Guards: 12 inches long. Include examples of joinery, corners, and field splices.

- D. Qualification Data: For qualified Installer.

- E. Warranty: Sample of special warranty.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

#### 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. Include mounting and accessory components. Replacement materials shall be from same production run as installed units

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
  - 1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.

## 1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures.
    - b. Deterioration of plastic and other materials beyond normal use.
  - 2. Warranty Period: Five years from date of Final Completion.

# PART 2 - PRODUCTS

## 2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide handrails capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Uniform load of 50 lbf/ft. applied in any direction.
  - 2. Concentrated load of 200 lbf applied in any direction.
  - 3. Uniform and concentrated loads need not be assumed to act concurrently.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

## 2.2 MATERIALS

- A. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M.
- C. Fasteners: Stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened, as recommended by manufacturer of items being mounted. Use security-type fasteners where exposed to view.

## 2.3 CORNER GUARDS

- A. Surface-Mounted, Corner Guards: Fabricated from one-piece, Formed or extruded with formed edges; with 90-degree turn to match wall condition.
  - 1. Manufacturers and Product: Refer to Finish Legend indicated on Drawings.
  - 2. Mounting: Flat-head, countersunk screws through factory-drilled mounting holes.

## 2.4 FABRICATION

- A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.
- B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

## 2.5 METAL FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - 1. Remove tool and die marks and stretch lines, or blend into finish.
  - 2. Grind and polish surfaces to produce uniform finish, free of cross scratches.
  - 3. Run grain of directional finishes with long dimension of each piece.
  - 4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements

for installation tolerances and other conditions affecting performance of work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

### 3.3 INSTALLATION

- A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
  - 1. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
    - a. Provide anchoring devices to withstand imposed loads.
    - b. Adjust caps as required to ensure tight seams.

### 3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

## SECTION 104413 - FIRE PROTECTION CABINETS

### 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. Fire-protection cabinets for the following:
    - a. Portable fire extinguishers.
- B. Related Requirements:
  - 1. Section 104416 "Fire Extinguishers."

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples 6 by 6 inches (150 by 150 mm) square.
- E. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semi-recessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Potter Roemer LLC. Model 7020-A-VAR-RR-6
- B. Cabinet Construction: Nonrated.
- C. Cabinet Material: Cold-rolled steel sheet.
- D. Recessed Cabinet:
  - 1. Trimless with Concealed Flange: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet. Provide recessed flange, of same material as box, attached to box to act as drywall bead.
  - 2. Trimless with Hidden Flange: Flange of same metal and finish as box overlaps surrounding wall finish and is concealed from view by an overlapping door.
  - 3. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
- E. Cabinet Trim Material: Steel sheet.
- F. Door Material: Steel sheet.
- G. Door Style: Fully glazed panel with frame.
- H. Door Glazing: Acrylic sheet.
  - 1. Acrylic Sheet Color: Clear transparent acrylic sheet.
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
  - 1. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- J. Accessories:
  - 1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
    - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
      - 1) Location: Applied to cabinet glazing location indicated on Drawings.
      - 2) Application Process: Decals or Pressure-sensitive vinyl letters.
      - 3) Lettering Color: Red.

4) Orientation: Vertical.

K. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
  - a. Finish: Baked enamel or powder coat.
  - b. Color: As selected by Architect from full range of industry colors and color densities.
2. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), 3 mm thick, with Finish 1 (smooth or polished).

2.2 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
  1. Weld joints and grind smooth.
  2. Provide factory-drilled mounting holes.
  3. Prepare doors and frames to receive locks.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
  1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
  2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.3 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.



## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

### 3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated on drawings.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
  - 1. Provide inside latch and lock for break-glass panels.
- C. Identification: Apply decals or vinyl lettering at locations indicated.

### 3.4 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 104413

## SECTION 104416 - FIRE EXTINGUISHERS

### 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 portable, hand-carried fire extinguishers.
- B. Related Requirements:
  - 1. Section 104413 "Fire Protection Cabinets."

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

#### 1.6 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

#### 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Failure of hydrostatic test according to NFPA 10.
    - b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Final Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
  1. Provide fire extinguishers approved, listed, and labeled by FM Global.

### 2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet **[and]** indicated.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Amerex Corporation.
    - b. Ansul Incorporated; Tyco International.
    - c. Badger Fire Protection.
    - d. Buckeye Fire Equipment Company.
    - e. Fire End & Croker Corporation.
    - f. Guardian Fire Equipment, Inc.
    - g. JL Industries, Inc.; a division of the Activar Construction Products Group.
    - h. Kidde Residential and Commercial Division.
    - i. Larsens Manufacturing Company.
    - j. MOON American.
    - k. Nystrom, Inc.
    - l. Pem All Fire Extinguisher Corp.; Pem Systems, Inc.
    - m. Potter Roemer LLC.
    - n. Pyro-Chem; Tyco Fire Suppression & Building Products.
    - o. Strike First Corporation of America.
  2. Valves: Manufacturer's standard.
  3. Handles and Levers: Manufacturer's standard.
  4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4A:80B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
  - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION 104416

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## SECTION 115343 –SERVICE FITTINGS AND ACCESSORIES

### PART 1 GENERAL

#### 1.01 SUMMARY

A. Section Includes:

1. Faucets, fittings and trim.
2. Service fittings and trim located on or in casework or on walls in laboratories.

B. Related Sections:

1. Section 123553.13 "Metal Laboratory Casework"
3. Plumbing/Mechanical: Division 22/23
4. Electrical: Division 26.

#### 1.02 QUALITY ASSURANCE

A. Codes: Comply with the State of New Jersey Codes and authorities having jurisdiction.

B. Standards:

1. National Sanitary Foundation (NSF) Standards.
2. American Society of Testing and Materials: ASTM A-167 (latest edition).

C. Single source responsibility: Laboratory trim and fittings, and accessories, shall be manufactured or furnished by a single laboratory furniture company.

D. Manufacturers' qualifications: Modern plant with proper tools, dies, fixtures and skilled workmen to produce high quality laboratory trim and fittings, and shall meet the following minimum requirements:

1. Ten years or more experience in manufacturing of laboratory casework and equipment of type specified.
2. Ten installations of equal or larger size and requirements.

#### 1.03 SUBMITTALS

A. Shop Drawings: Submit in accordance with Division 1.

1. Shop drawings accurately interpret the Contract Documents and shall also show adjoining work in such detail as required to provide proper connections with said adjoining work. Where adjoining connected work requires Shop Drawings, such Shop Drawings shall be submitted at the same time so that connection can be checked.
2. Submit shop drawings for custom items indicating field dimensions, adjacent construction, filler panels, utility connections and other requirements.

- B. Product Data: Submit manufacturer's data and installation instructions for each fitting and trim item edited to job conditions.
- C. Verify all field measurements. Measurements available prior to submittal of shop drawings shall be shown and so noted on the shop drawings. Measurements not available prior to submission of shop drawings shall be noted on the shop drawings as not available and such measurements shall be obtained prior to fabrication.

#### 1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver fittings and trim in clearly identified packaging indicating manufacturers' name and stock number, etc.
- B. Store and protect fittings and trim from subsequent construction as recommended by the manufacturer.

#### 1.05 WARRANTY

- A. The manufacturer must provide a 5 (five) year warranty on all fixtures provided.

### PART 2 PRODUCTS

#### 2.01 FAUCETS, FITTINGS AND TRIM

- A. Manufacturer: Design, materials, construction and finish of faucets fittings and trim specified are the minimum acceptable standard of quality. The basis of this product specification is Watersaver Faucet Co. ColorTech 701 West Erie Chicago, Illinois 60610 312-333-5500.
- B. The manufacturer for the submitted product is to provide line by line, item by item comparative description, listing variations of the specified and proposed product, fully documented to show compliance with the drawings and specifications. Include proposed product data sheets, manufacturer name, product number, complete specifications, descriptive data and independent test reports, and furnish samples as required. If the proposed submitted product is not documented as specified, the shop drawings will be returned not reviewed.
- C. Trim and Fitting Assemblies: Fittings scheduled shall have the following features:
  - 1. Material shall be carefully selected to accommodate the media used. The Valve house shall be of high quality forged brass for maximum material density.
  - 2. All fixtures shall be supplied with features per plumbing trim selection (no deviations accepted) as well as the following specifications.
  - 3. All valves for gases and water shall have an integrated shutoff valve for presetting of flow as well as shutoff for maintenance.
  - 4. The coating on all fixtures and handles shall be an electrostatically applied polyester powder coating, highly resistant to most chemicals, heat and ultraviolet fading. No deviation accepted.

5. Headworks for all laboratory service fixtures shall be renewable units containing all working components subject to wear.
6. Special Cleaning of brass components: All brass components shall be specifically washed and cleaned before being coated and assembled to avoid any machining/cooling oil to be in contact with the media. Maximum amount of pollution shall not exceed 200mg/square meter.
7. Handles shall be made of metal and powder coated according to US recommendations for media indication. No deviation accepted.
8. Handle Colour Schedule:

Service	Colour	Letters	
Cold Water	Dark Green	CW	
Hot Water	Red	HW	
Air	Orange	AIR	
Vacuum	Yellow	VAC	
Vacuum	Yellow	VC	from vacuum cabinet
Nitrogen	Brown	N2	
Argon	Violet	AR	
Carbon Dioxide	Pink	CO2	
Helium	Black	He	
Pure Water	White	RO	

D. Water Faucet Trim and Fitting Assemblies:

1. Pressure Testing: All fixtures shall be pressure tested before leaving the factory. Maximum working pressure for water fixtures must be a minimum 147 PSI. No deviation accepted.
2. Nozzles: Nozzles for water shall be fixed yet detachable with a hexagon key which is used inside of the nozzle to avoid damaging of the chemical resistant coating. The nozzle shall be tapered and shall be serrated. The valve house shall be prepared for female 3/8" connection once the nozzle has been removed.
3. Headworks: Provide hot and cold water. Provide ceramic headwork cartridge, no deviation accepted.
  - a. Opening/closing function: 180 degree turn.
  - b. Opening/closing function: 90 degree turn for blade handles.
4. Water fixtures shall be supplied with a field adjustable gooseneck for either partly swivel turn, 360 degree swivel turn or fixed in any desired location. Only double O-ring seal will be accepted.
  - a. All goosenecks shall provide a 1/2" male outlet thread for attachment or aerators, serrated nozzles at each faucet.
  - b. Aspirators shall be provided at all goosenecks as indicated.
  - c. Where indicated by product number, a vacuum breaker shall be integrated in gooseneck.



5. Pure Water Faucet assemblies shall be coordinated with plumbing requirements as specified.
  6. Eyewash: Fittings scheduled shall have the following features:
    - a. F5 – Right hand (specify left hand mounting “LH”) deck mounted AutoFlow swivel eye wash less bowl with ½” IPS plug-type valve with PTFE coated O-ring seals. Supplied with in-line strainer to protect valve and spray heads from debris in water line. Unit shall have (2) polypropylene GS-Plus™ spray heads with integral “flip-top” dust covers, filters and 1.6 GPM flow control orifices mounted on a chrome plated brass eyewash assembly. Activate valve by rotating 90° from stored position. Unit shall include ANSI compliant sign.
    - b. Performance: Unit shall be fully factory assembled and hydrostatically tested to meet or exceed ANSI Z358.1 – 2014 and come with a full 2-year warranty.
    - c. Fixture: Guardian Equipment G1805 and G1805LH.
- E. Gas Fittings and Trim Assemblies:
1. Assembly:
    - a. Ground key cocks for general use shall be chrome plated brass tested to 300 PSI (100 PSI working pressure).
    - b. Needle valves (for fine control) shall be chrome plated brass tested to 147 PSI (100 PSI working pressure).
    - c. Local Shut Off: Gas fittings and/or valves are to incorporate integral ball valve to shut off gas in connection with product service, medium conservation and a safety lock preventing unintended opening of the fixture, without the need to shut off a line valve.
  2. Mounting shanks and NPT connection locknuts shall be factory installed and tested as needed for intended installation. Provide O-ring to seal underneath.
  3. Pressure Testing: All fixtures shall be pressure tested before leaving the factory.
    - a. Maximum working pressure for all air, vacuum and non-burning gas fixtures shall be minimum 147 PSI. No deviation accepted.
    - b. Fixtures for burning gases shall have a minimum working pressure of 100 PSI.
  4. Nozzles: Nozzles for non burning gases and oxygen shall be fixed yet detachable with a hexagon key which is used inside of the nozzle to avoid damaging of the chemical resistant coating. The nozzle shall be tapered and serrated. The valve house shall be prepared for female 3/8” connection once the nozzle has been removed.
  5. Headworks for all laboratory service fixtures shall be renewable units containing all working components subject to wear:

- a. Air and Non Burning Gases: Fine regulating headwork, with replaceable components and seat. Provide user with fine flow control for accurate flow adjustment.
- b. Vacuum (VAC): High flow headwork, with replaceable components and seat resistant to chemicals. Provide user with a high flow characteristic.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Coordinate with the work of other sections to insure the proper installation of fittings and trim.

### 3.02 INSTALLATION

- A. Workmanship: Install trim and fittings plumb, level and in alignment with adjacent materials.
- B. Supplementary Parts: Include supplementary parts necessary to complete trim and fitting work.
- C. Fittings:
  - 1. Mount fittings on or in laboratory countertops, casework, reagent racks and partitions as indicated on the drawings.
- D. Utility Piping: Provide utility piping and connections to fixtures.
- E. All fixtures shall be supplied complete with threaded mounting shank for NPT connection. Mounting hardware with stainless steel locking ring and nut with set screws for vandal resistance and protection of plumbing under countertops shall be included. Provide O-ring to seal underneath the fixture flange and countertop and to avoid liquids from running off the countertop.

### 3.03 PROTECTION

- A. Protect installed components from damage during subsequent construction.

### 3.04 FIXTURE SCHEDULE

- A. Refer to the Plumbing Fixture Schedule on Drawings.

END OF SECTION 115343

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## SECTION 122413 - ROLLER WINDOW SHADES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Work Results:

1. Provide manually operated roller shades where indicated on the drawings.

B. Principal Products:

1. Manually operated roller shades with single and double rollers.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than 3 inches square. Mark inside face of material if applicable.
2. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
3. Installation Accessories: Full-size unit, not less than 10 inches long.

D. Roller-Shade Schedule: Use same designations indicated on Drawings.

#### 1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roller shades to include in maintenance manuals.

#### 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. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

#### 1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

## 1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers and Products: WT Shades, H200 Solomount bracket with front fascia in Silver 20.
  - 1. Shade Material: Refer to Finish Legend indicated on Drawings.
- B. Source Limitations: Obtain roller shades from single source from single manufacturer.

### 2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
  - 1. Bead Chains: Stainless steel.
    - a. Loop Length: Length required to make operation convenient from floor level.
    - b. Limit Stops: Provide upper and lower ball stops.
    - c. Chain-Retainer Type: Chain tensioner.
  - 2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.
    - a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criteria are more stringent.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller

assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Shadebands:

1. Shadeband Material: As indicated on the Drawings.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
  - a. Type: Enclosed in sealed pocket of shadeband material.

E. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
  - a. Shape: L-shaped.
2. Installation Accessories Color and Finish: As selected from manufacturer's full range.
3. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.

## 2.3 MANUALLY OPERATED SHADES WITH DOUBLE ROLLERS

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Stainless steel.
  - a. Loop Length: Length required to make operation convenient from floor level.
  - b. Limit Stops: Provide upper and lower ball stops.
  - c. Chain-Retainer Type: Chain tensioner.
2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.
  - a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criteria are more stringent.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Double-Roller Mounting Configuration: Outside roller over and inside roller under.
2. Inside Roller:
  - a. of Shadeband Roll: Regular, from back of roller.
3. Outside Roller:
  - a. Direction of Shadeband Roll: Reverse, from front of roller.
4. Shadeband-to-Roller Attachment: Manufacturer's standard method .

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller

mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

D. Inside Shadebands:

1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

E. Outside Shadebands:

1. Shadeband Material: Light-blocking fabric.

F. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
  - a. Shape: L-shaped.
  - b. Finish: Satin anodized standard finish.
2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
3. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
4. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
5. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
6. Installation Accessories Color and Finish: As selected from manufacturer's full range.

## 2.4 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.

1. Source: Roller-shade manufacturer.
2. Type: Fiberglass with acrylic backing.
3. Pattern, Style, and Color: As indicated on Drawings
4. Roll Width: 100 inches.
5. Features: Antistatic treatment.

## 2.5 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in

which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch.  
Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.

- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
  - 1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4 provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 ROLLER-SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
  - 1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

#### 3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

#### 3.4 CLEANING AND PROTECTION

- A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 122413



## SECTION 123553.13 – METAL LABORATORY CASEWORK

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section includes:

1. Laboratory casework system that includes support and utility-space framing, wall panels, and modular countertops.

B. Related Sections:

1. Rough Carpentry
2. Laboratory Fume Hoods
3. Laboratory accessories.
4. Water, laboratory gas, and electrical service fittings.
5. Electrical
6. Mechanical

#### 1.2 DEFINITIONS

- A. Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48" above floor, and visible surfaces in open cabinets or behind glass doors.

1. Ends of cabinets, including those installed directly against walls or other cabinets, are defined as "exposed."

- B. Semiexposed Surfaces of Casework: Surfaces behind opaque doors, such as cabinet interiors, shelves, and dividers; and interiors and sides of drawers.

1. Tops of cabinets 78" or more above floor are defined as "semiexposed."

- C. Concealed Surfaces of Casework: Include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. System Structural Performance: Laboratory casework and module support framing system shall withstand effects of the following minimum gravity loads and stresses without permanent deformation, excessive deflection, or binding of drawers and doors:

1. Top of Support Framing System: 500 lb/ft.
2. Shelves:
  - a. 6", 8", and 12" Deep: 180 lbs. per shelf.
  - b. 18" Deep: 130 lbs. per shelf.
  - c. 24" Deep: 100 lbs. per shelf.
3. Work Surfaces, Dead and Live Load: 600 lbs. per surface.

4. Dead and Live Load, Total: 1520 lbs. supported by structure above work surface, per freestanding extended table frame.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For laboratory casework. Include plans, elevations, sections, details, and attachments to other work.
  1. Include plans, elevations, sections, and attachments to other work including blocking and reinforcements required for installation.
  2. Indicate types and sizes of casework.
  3. Indicate manufacturer's catalog numbers for casework.
  4. Show fabrication details, including types and locations of hardware.
  5. Indicate locations and types of service fittings.
  6. Include details of utility spaces showing supports for conduits and piping.
  7. Include details of support framing system.
  8. Include details of exposed conduits, if required, for service fittings.
  9. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
  10. Include coordinated dimensions for laboratory equipment specified in other Sections.
  11. Include coordinated dimensions for laboratory equipment specified in other Sections.
- C. Keying Schedule: Include schematic keying diagram, and index each key set to unique designations that are coordinated with the Contract Documents.
- D. Samples for Verification: For each type of cabinet finish and each type of countertop material indicated, in manufacturer's standard sizes.
- E. Qualification Data: For qualified manufacturer.
- F. Product Test Reports for Countertop Surface Material: Based on evaluation of comprehensive tests performed by qualified test agency, indicating compliance of laboratory countertop surface materials with requirements specified for chemical and physical resistance.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Qualified manufacturer that produces laboratory casework of type indicated for this Project; whose products have a record of successful in-service performance.
- B. Source Limitations: Obtain laboratory casework from single source from single manufacturer unless otherwise indicated.
- C. Product Designations: Drawings indicate sizes and configurations of laboratory casework. Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects or performance characteristics, as judged solely by Architect, except with Architect's approval. Other manufacturers' laboratory of similar sizes and configurations, and complying with the Specifications and Project requirements may be considered. Refer to 016000 Product Requirements.
- D. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying requirements.
- E. Preinstallation Conference: Conduct at Project site.
- 1.6 DELIVERY, STORAGE, AND HANDLING
  - A. Protect finished surfaces during handling and installation with protective covering.
- 1.7 FIELD CONDITIONS
  - A. Established Dimensions: Where laboratory casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.
  - B. Field Measurements: Where laboratory casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.
  - C. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.
- 1.8 COORDINATION
  - A. Coordinate layout and installation of framing and reinforcements for support of laboratory casework.
  - B. Coordinate installation of laboratory casework with installation of fume hoods and other laboratory equipment.
- 1.9 EXTRA MATERIALS
  - A. Furnish complete touchup kit for each type and color of metal laboratory casework provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged laboratory casework finish.
  - B. Furnish complete touchup kit for each type and color of wood laboratory casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged laboratory casework finish.
  - C. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
    1. Cabinet Mounting Clips and Related Hardware: Quantity equal to 5 percent of amount installed, but no fewer than 20 of each type.

## PART 2 - PRODUCTS

### 2.1 MODULAR STEEL LABORATORY CASEWORK

- A. Source Limitations: Obtain laboratory casework from single source from single manufacturer unless otherwise indicated.
- B. Product Designations: Drawings indicate sizes and configurations of laboratory casework by referencing designated manufacturer's catalog numbers. Other manufacturers' laboratory casework of similar sizes and similar door and drawer configurations and complying with Specifications may be considered. See Section 016000 "Product Requirements."
- C. General Casework Design Requirements:
  - 1. Casework Product Standard: Comply with SEFA 8 M, "Laboratory Grade Metal Casework."
  - 2. Flush construction: Surfaces of doors, drawers and panel faces shall align with cabinet fronts without overlap of case ends, top or bottom rails. Horizontal and vertical case shell members (panels, top rails and bottoms) shall meet in the same plane without overlap, cracks or crevices.
  - 3. Slimline styling: Front width of end panels 3/4" and front height of top and bottom members 1".
  - 4. Self-supporting units: Completely welded shell assembly without applied panels at ends, backs or bottoms, so that cases can be used interchangeably or as a single, stand-alone unit.
  - 5. Interior of case units: Easily cleanable, flush interior. Base cabinets, 30" and wider, with double swinging doors shall provide full access to complete interior without center vertical post.
  - 6. Drawers: Sized on a modular basis for interchange to meet varying storage needs, and designed to be easily removable in field without the use of special tools.
  - 7. Case openings: Rabbeted-like joints all four sides of case opening for hinged doors and two sides for sliding doors in order to provide dust resistant case.
- D. General Casework Performance Requirements:
  - 1. Structural performance requirements: Casework components shall withstand the following minimum loads without damage to the component or to the casework operation:
    - a. Steel base unit load capacity: 500 lbs. per lineal foot.
    - b. Drawers in a cabinet: 150 lbs.
    - c. Hanging wall cases: 300 lbs.
    - d. Load capacity for shelves of base units, wall cases and tall cases: 40 lbs. per square foot.
  - 2. Metal Finish Performance Requirements:
    - a. Abrasion resistance: Maximum weight loss of 5.5 mg. per 100 cycle when tested on a Taber Abrasion Tester #E40101 with 1000 gm wheel pressure and Calibrase #CS10 wheel.
    - b. Hardness: Surface hardness equivalent to 4H or 5H pencil.
    - c. Humidity resistance: Withstand 1000 hour exposure in saturated humidity at 100 degrees F.
    - d. Moisture resistance: No visible effect to surface finish after boiling water trickled over test panel inclined at 45 degrees for five minutes. No visible

effect to surface finish following 100 hour continuous application of a water soaked cellulose sponge, maintained in a wet condition throughout the test period.

- e. Adhesion: Score finish surface of test panel with razor blade into 100 squares, 1/16" x 1/16", cutting completely through the finish but with minimum penetration of the substrate, and brush away particles with soft brush. Minimum 95 squares shall maintain their finish.
- f. Salt spray: Withstand minimum 200 hour salt spray test.

## 2.2 COUNTERTOP MATERIALS

- A. Countertops, General: Provide units with smooth surfaces in uniform plane free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of 1", with continuous drip groove on underside 1/2" from edge, or as otherwise indicated.
- B. Sinks, General: Provide sizes indicated or laboratory casework manufacturer's closest standard size of equal or greater volume, as approved by Architect, and as indicated on Drawings.
- C. Epoxy: Factory-molded, modified epoxy-resin formulation with smooth, nonspecular finish; provide where indicated.

### 1. Physical Properties:

- a. Flexural Strength: Not less than 10,000 psi.
- b. Modulus of Elasticity: Not less than 2,000,000 psi.
- c. Hardness (Rockwell M): Not less than 100.
- d. Water Absorption (24 Hours): Not more than 0.02 percent.
- e. Heat Distortion Point: Not less than 260 deg F.

### 2. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents per NEMA LD 3, Test Procedure 3.4.5:

- a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70 percent), phenol, sulfuric acid (60 percent), and toluene.
- b. Slight Effect: Chromic acid (60 percent) and sodium hydroxide (50 percent).

### 3. Color: Kemresin, Slate unless noted otherwise. Black where indicated only.

## 2.3 SINKS AND DRAINS

- A. Sinks, General: Provide sizes indicated or laboratory casework manufacturer's closest standard size of equal or greater volume, as approved by Architect, and as indicated on Drawings. Refer to Section 115343 "Service Fittings and Accessories" for sink specifications.
- B. Sink Supports:

1. Support sinks on 11 gauge, adjustable 1" x 2" x 1" metal channel with reagent resistant finish. Provide two channels across width of cabinet, attached to 3/8" diameter threaded hanger rods.
2. Provide joint sealant joint between countertop and sink with non hardening mastic.

## 2.4 LABORATORY CASEWORK SYSTEM

- A. Basis-of-Design Product: Kewaunee Scientific Corporation, Research Collection.
  1. Inset – Contour: Drawers and doors, shall have a full width, integral contour radiused pull along the top edge, and when closed, shall be recessed to create an overall flush face with 1/8" reveals. The outer drawer and door head shall have a channel formation on all four sides to eliminate sharp raw edges of steel. The top front corners of the door shall be welded and ground smooth.
- B. Mobile cabinets: Kewaunee Scientific Corporation, Research Collection.
  1. Inset – Contour: Drawers and doors, shall have a full width, integral contour radiused pull along the top edge, and when closed, shall be recessed to create an overall flush face with 1/8" reveals. Evolution cabinets basis of design.
- C. Provide casework manufacturer's standard integrated system that includes support framing, suspended modular cabinets, countertops, and fittings needed to assemble system. System includes hardware and fasteners for securing support framing to permanent construction.
  1. Base cabinets can be removed without providing temporary support for, or removing, countertops.
- D. Countertops: Provide in modular lengths indicated, without seams.

## 2.5 CASEWORK MATERIALS

- A. Sheet steel: Mild, cold rolled and leveled unfinished steel.
- B. Minimum gauges:
  1. 20 gauge: Solid door interior panels, drawer fronts, scribing strips, filler panels, enclosures, drawer bodies, shelves, security panels and sloping tops.
  2. 18 gauge: Case tops, ends, bottoms, bases, backs, vertical posts, uprights, glazed door members, door exterior panels and access panels.
  3. 16 gauge: Top front rails, top rear gussets, intermediate horizontal rails, table legs and frames, leg rails and stretchers.
  4. 14 gauge: Drawer suspensions, door and case hinge reinforcements and front corner reinforcements.
  5. 11 gauge: Table leg corner brackets and gussets for leveling screws.

## 2.6 HARDWARE

- A. General: Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware.
  1. Finish: As selected by Architect from manufacturer's full range.

2. Design: Verify with Architect.
3. Strainers and tailpieces.

## 2.7 CASEWORK FABRICATION

### A. Metal Cabinets:

1. End uprights shall be formed into not less than a channel formation at top, bottom, back and front. The front edge shall further offset to form a strike for doors and drawers, and shall be perforated for the support of drawer channels, intermediate rails and hinge screws. An upright filler shall be screwed in place in all cupboard units to close the back of the channel at front of the upright and to provide a smooth interior for the cupboard to facilitate cleaning. The upright filler shall be perforated with shelf adjustment holes at not more than 2" centers painted prior to assembly. The inside front of the upright shall be further reinforced with a full height 16 gauge hinge reinforcement angle.
2. Top horizontal rail on base cabinets shall interlock within the flange at top of end panels for strength, but shall be flush as face of unit. Top rail shall have a full width rabbet for swinging doors and drawers. Reinforcements shall be provided at all front corners for additional welded strength between vertical and horizontal case members.
3. Intermediate rails shall be provided between doors and drawers, but shall not be provided between drawers unless made necessary by locks in drawers. When required, intermediate rails shall be recessed behind doors and drawer fronts, and designed so that security panels may be added as required.
4. Intermediate vertical uprights shall be furnished to enclose cupboards when used in a unit in combination with a half width bank of drawers. However, to allow storage of large or bulky objects, no upright of any type shall be used at the center of double door cupboard units.
5. Cabinet bottom, and bottom rail shall be formed of one piece of steel except in corner units and shall be formed down on sides and back to create a square edge transition welded to cabinet end panels, and front edge shall be offset to create a seamless drawer and door recess rabbet for dust stop.
6. Toe space rail shall extend up and forward to engage bottom rail to form a smooth surfaced fully enclosed toe space, 3" deep x 4" high. Whenever toe space base is omitted for units to set on building bases on separate steel bases, then the toe space rail shall extend back 4-1/2".
7. Back construction shall consist of a top and bottom rail, channel formed for maximum strength and welded to back and top flange of end uprights, open for access to plumbing lines.
8. Die formed gussets, with multiple ends for strength, shall be furnished in each bottom corner of base units to insure rigidity, and a 3/8"-16 leveling bolt, 3" long, shall engage a clinch nut in each gusset. Access to the leveling bolts shall be through plug buttons in the bottom pan. Each leveling bolt and gusset shall be capable of supporting 500 lbs. Access to leveling bolts through toe space or leveling bolts requiring special tools to adjust are not acceptable.
9. Adjustable shelves shall be formed down 3/4", returned back 7/8" and up 1/4" into a channel formation front and rear; formed down 3/4" at each end, shelves over 42" long shall be further reinforced with a channel formation welded to underside of shelf.
10. Drawer bodies shall be made in one-piece construction including the bottom, two sides, back and front. They shall be fully coved at interior bottom on all four sides for easy cleaning. The top front of the inner drawer body shall be offset to interlock with the channel formation in drawer head providing a 3/4" thick drawer head.
11. Drawer suspension assembly shall consist of 2 sections providing a quiet, smooth operation on ball bearing nylon rollers. All drawers shall be self-closing from a point 5" open. Cabinet channels shall maintain alignment of drawer and provide an integral

drawer stop, but the drawer shall be removable without the use of tools. Drawers shall provide 13-5/8" front to back clearance when fully extended. Drawers shall rise when opened thus avoiding friction with lower drawers and/or doors. Drawer suspension system shall incorporate a double stop, lock open feature. Case suspension channels shall be Galvanized Steel, drawer suspension channels shall be Cold Rolled Steel.

12. Steel Door assembly (two-piece) for solid pan swinging doors shall consist of an inner and outer door pan. Outer door pan shall be formed at all four sides. The corners on the pull side of the outer door pan shall be welded and ground smooth to prevent exposure of sharp edges of steel at these critical points. Inner door pan shall be flanged at all four sides with hinge reinforcements welded in place. The door assembly shall be 3/4" thick and contains sound deadening material.
13. Steel Drawer/door assemblies shall be painted prior to assembly. Both shall be punched for attaching drawer pulls. Likewise, inner pan formation of door and drawer body shall be indented for in-field installation of locks when required.
14. Doors shall be readily removable and hinges easily replaceable. Hinges shall be applied to the cabinet and door with screws. Welding of hinges to either cabinet or door will not be acceptable.
15. Knee space panels, where shown or specified, shall be 20 gauge, finished same as casework cabinets, and easily removable for access to mechanical service areas.

B. Drawers:

1. Drawer fronts: 3/4" thick, double wall construction, pre-painted prior to assembly and sound deadened.
2. Drawer bodies: Bottom and sides formed into one-piece center section with bottom and sides coved and formed top edges. Front and back panels spot welded to center section.
3. Drawer suspension: Heavy duty coved raceways for both case and drawer with nylon tired, ball bearing rollers; self-centering and self-closing when open to within 3" of the closed position.
4. Provide drawer with rubber bumpers. Friction centering devices are not acceptable.
5. Provide security panels for drawers typical.
6. Provide with 150# standard extension heavy duty slides for full access and operation.

C. Doors:

1. Solid panel doors: 3/4" thick, double wall, telescoping box steel construction with interior prepainted and sound deadened, top corners welded and ground smooth. Reinforce interior of front panel with welded steel hat channels. Hinges with screws to internal 14 gauge reinforcing in case and door. Hinges shall be removable; welding of hinges not acceptable. Doors shall close against rubber bumpers.

D. Shelves:

1. Form front and back edges down and back 3/4". Form ends down 3/4".
2. Reinforce shelves over 36" long with welded hat channel reinforcement the full width of shelf.
3. Pull out shelves: Same suspension as specified for drawers.

- E. Base molding: 4 inch high, to be furnished and installed by flooring contractor. Install 1/8 inch thick by the height of the specified vinyl base, phenolic resin filler panel along all exposed sides of the cabinet base, including the toe kick. Scribe to the floor.

F. Hardware:



1. Hinges: Hinges shall be made of Type 304 stainless steel .089 thick, 2-1/2" high, with brushed satin finish, and shall be the institutional type with a five-knuckle bullet-type barrel. Hinges shall be attached to both door and case with two screws through each leaf. Welding of hinges to door or case will not be accepted. Doors under 36" in height shall be hung on one pair of hinges, and doors over 36" high shall be hung on 3 hinges.
2. Door catches: Adjustable type, spring actuated nylon roller catches.
3. Elbow catches: Spring type of cadmium plated steel, with strike of suitable design.
4. Leg Shoes: Leg shoes shall be provided on all table legs, unless otherwise specified, to conceal leveling device. Shoes shall be a pliable, black vinyl material. Use of a leg shoe, which does not conceal leveling device, will not be acceptable.
5. Shelf clips: Shelf adjustment clips shall be nickel-plated steel.
6. Drawer/Shelf Slides: Heavy duty, full extension, soft-close, self-closing, zinc plated, ball bearing slides, rated for 100 pound loads.
7. Positive Catch: A two-piece heavy-duty cam action positive catch shall be provided on all base cupboard doors and shall be positioned near the pivoting edge of door to provide a clean unobstructed opening. Main body of the catch shall be confined within an integral cabinet divider rail, while latching post shall be mounted on the hinge side of door. Nylon roller type catches are not acceptable.
8. Sink Supports: Sink supports shall be the hanger type, suspended from top front and top rear horizontal rails of sink cabinet by four 1/4" dia. rods, threaded at bottom end and offset at top to hang from two full length reinforcements welded to the front and rear top rails. Two 3/4" x 1-2/2" x 12 gauge channels shall be hung on the threaded rods to provide an adjustable sink cradle for supporting sinks. When sink capacity exceeds 3,750 cu. in., the sink supports shall be suspended from full-length reinforcements welded to the two end rails. Two 1" x 2" x 10 gauge full-length channels shall be hung from the four 1/4" dia. rods to provide an alternate sink cradle.
9. Support Struts: Support struts shall consist of two 16 gauge channel uprights fastened top and bottom by two adjustable "U" shaped spreaders, each 12 gauge, 1-1/2" x length required formed from galvanized steel. Struts shall be furnished to support drain troughs, and to support worktop at plumbing space under fume hood superstructures or other heavy loads. Support struts can be furnished with hangers at extra cost when specified, to support mechanical service piping and drain lines.

## 2.8 TABLE FRAMES

- A. In general, freestanding tables and/or apron and leg assemblies consist of welded leg assemblies connected to aprons by mechanical fasteners.
- B. Table apron rails shall be formed of 16-gauge steel. The rails shall be 4" high, formed top and bottom into a 1.844" wide channel formation with 3/8" high return. Where drawers occur, the apron rails shall provide the required opening.
- C. Table legs shall be 2" square welded tubing. Securely welded to bottom end shall be a 14-gauge die formed gusset with four flanges. A threaded clinch nut shall accommodate a 3/8" 16 x 2-1/2" long adjustment bolt.
- D. Stretchers shall be constructed of 18-gauge steel and furnished where indicated on drawings. They shall be formed into a 2-7/64" x 1-1/2" channel formation, and secured to table legs by a die-formed clip of 16-gauge steel. Clips shall be welded at ends of channel.
- E. Table tops shall be as indicated on drawing and by specifications, and all clips, screws and parts for fastening top to apron, shall be provided with apron section. Leg shoes for table legs shall be furnished with leg assembly.

## 2.9 SERVICE SUPPORT STRUTS (SERVICE CHASE)

- A. Provide open slot metal bracing systems for this project.
- B. For the purposes of this project, the product identification numbers of Unistrut have been used. If another manufacturer is submitted on this project, provide a comparison chart showing the product numbers of both manufacturers.
- C. Service support struts: Heavy 1-5/8" x 1-5/8" steel channel uprights, Unistrut P-1000 series or approved equal.
  - 1. Fasten at top and bottom with U-shaped epoxy coated spreader and bolts, designed to support tops, box curbs, troughs, hoods, or other heavy loads. Attach spreaders with Unistrut clips and 1/2" hex head nuts.
  - 2. Service piping and drain line hanger supports shall be provided by the General Contractor.
  - 3. Service support struts shall be installed prior to the casework for the use of other trades.
  - 4. The work surface and service fittings for the chase shall be mounted independently of the remainder of countertops and cabinets.

## 2.10 METAL FINISH

- A. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pre-treat with iron phosphate spray, water rinse, and neutral final seal. Immediately dry in heated ovens, gradually cooled, prior to application of finish.
- B. Application: Electrostatically apply urethane powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thickness: Liquid, dipped, solvent based finishes are not and will not be acceptable.
  - 1. Exterior and interior exposed surfaces: 1.5 mil average and 1.2 mil min.
  - 2. Backs of cabinets and other surfaces not exposed to view: 1.2 mil average.
- C. Cabinet Surface Finish Tests: All casework construction and performance characteristics shall be in full compliance with SEFA 8 – 1999 standards. At the owner's request, independent, third party performance testing must be submitted validating compliance and adheres to the finish specifications.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of laboratory casework and furnishings.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION OF CABINETS

- A. Service Support Strut (Service Chase):

1. Set strut system components into final position true to line, level, and plumb, in accordance with approved shop drawings.
  2. Anchor material firmly in place to building structure fastening to solid supporting material, not to gypsum board. Shim as required using concealed shims as recommended by manufacturer and approved by Architect.
  3. Bolt together with joints flush, tight and uniform. Tighten all connections to their recommended torque.
  4. Abut to edge surfaces in one true plane.
  5. Upon completion of this work, remove all protective wraps and debris. Repair any damage due to installation of this work. Area shall be broom clean.
- B. Install cabinets in accordance with SEFA 2.3 "Installation of Scientific Laboratory Furniture and Equipment" and manufacturer's instructions.
- C. Install level, plumb, and true; shim as required, using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
1. Wall .Cabinets: Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top; at not less than 24 inches O.C. Align similar adjoining doors to a tolerance of 1/16 inch.
- D. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.
- E. Adjust laboratory casework and hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer

### 3.3 INSTALLATION OF FIXED WORK SURFACES

- A. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where shown on Shop Drawings.
- B. Field Jointing: Where possible, make in the same manner as shop jointing using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop. Keep field joints to absolute minimum. Provide full length one-piece tops where ever possible.
1. Use concealed clamping devices for field joints in plastic-laminate countertops. Locate clamping devices within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a uniform heavy pressure at joints.
- C. Fastening:
1. Secure countertops, except for epoxy countertops, to cabinets with Z.-type fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back.
  2. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than 48 inches O.C.
  3. Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 inch and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.

- D. Provide required holes and cutouts for service fittings.
- E. Provide scribe moldings for closures at junctures of countertop, curb, and splash, with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.
- F. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- G. Seal edges of tops, backsplashes and side splashes to adjacent wall surface with acid-resistant sealant.

#### 3.4 INSTALLATION OF SINKS AND ACCESSORIES

- A. Install accessories according to Shop Drawings and manufacturer's written instructions.
- B. Securely fasten adjustable shelving supports, shelves, and pegboards to partition framing, wood blocking, or reinforcements in partitions.
- C. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.
- D. Sink installation: Sinks which were not factory installed shall be set in chemical resistant sealing compound and secured and supported per manufacturer's recommendations.

#### 3.5 CLEANING AND PROTECTING

- A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- B. Cover for protection against soiling and deterioration during remainder of construction period.
- C. Clean finished surfaces, touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 123553.13

## **SECTION 210500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Pipe, fittings, valves, connections and accessories for sprinkler, standpipe and fire hose, and clean agent fire suppression systems.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; The American Society of Mechanical Engineers.
- C. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers.
- D. ASME B16.4 - Gray Iron Threaded Fittings; The American Society of Mechanical Engineers.
- E. ASME B16.5 - Pipe Flanges and Flanged Fittings; The American Society of Mechanical Engineers; (ANSI/ASME B16.5).
- F. ASME B16.9 - Factory-made Wrought Steel Buttwelding Fittings; The American Society of Mechanical Engineers.
- G. ASME B16.11 - Forged Steel Fittings, Socket-welding and Threaded; The American Society of Mechanical Engineers.
- H. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; (ANSI B16.18).
- I. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.
- J. ASME B16.25 - Buttwelding Ends; The American Society of Mechanical Engineers.

- K. ASME B36.10M - Welded and Seamless Wrought Steel Pipe; The American Society of Mechanical Engineers.
- L. ASTM A 47/A 47M - Standard Specification for Ferritic Malleable Iron Castings.
- M. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- N. ASTM A 135 - Standard Specification for Electric-Resistance Welded Steel Pipe.
- O. ASTM A 234/A 234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
- P. ASTM A 795/A 795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
- Q. ASTM B 32 - Standard Specification for Solder Metal.
- R. ASTM B 75 - Standard Specification for Seamless Copper Tube.
- S. ASTM B 75M - Standard Specification for Seamless Copper Tube (Metric).
- T. ASTM B 88 - Standard Specification for Seamless Copper Water Tube.
- U. ASTM B 88M - Standard Specification for Seamless Copper Water Tube (Metric).
- V. ASTM F 438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
- W. ASTM F 439 - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- X. ASTM F 442/F 442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR).
- Y. ASTM F 493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- Z. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society, current edition, including all errata.
- AA. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society.

- AB. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; American Water Works Association; (ANSI/AWWA C105/A21.5).
- AC. AWWA C110/A21.10 - American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 In., for Water and Other Liquids; American Water Works Association.
- AD. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association; (ANSI/AWWA C111/A21.11).
- AE. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association; (ANSI/AWWA C151/A21.51).
- AF. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association.
- AG. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; National Fire Protection Association.
- AH. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances; National Fire Protection Association.
- AI. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.
- AJ. UL 262 - Gate Valves for Fire-Protection Service; Underwriters Laboratories Inc.
- AK. UL 312 - Check Valves for Fire-Protection Service; Underwriters Laboratories Inc.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.
- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
- C. Project Record Documents: Record actual locations of components and tag numbering.
- D. Operation and Maintenance Data: Include installation instructions and spare parts lists.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

- B. Welding: Qualify welders for structural supports according to AWS D1.1. Qualify pipe welders according to ASME Boiler and Pressure Vessel Code: Section IX. Comply with ASME B31 series, "Code for Pressure Piping".
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.
- D. Conform to UL and FM requirements.
- E. Valves: Bear UL or FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- F. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

#### **1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Deliver and store valves in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

#### **1.07 EXTRA MATERIALS**

- A. Provide two valve stem packings for each size and type of valve installed.
- B. Provide finished, wall mounted steel cabinet with hinged cover, with space for minimum of six spare sprinklers, plus sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler on the project. Number of sprinklers shall conform to NFPA 13.

#### **1.08 WORK INCLUDED**

- A. The work under this specification shall include, but not be limited to, the items listed below:
  - 1. The building is currently protected by a wet sprinkler system. The contractor shall alter the existing system as required, including pipe, fittings, sprinkler heads, hangers, valves, alarm devices and the like, to make the installation complete whether all components are specifically mentioned or not.



## **1.09 CODES, STANDARDS AND REGULATIONS**

- A. The work and materials shall conform to the requirements of the latest editions of Pamphlet No. 13 and 25 of the National Fire Protection Association and to all applicable requirements of the

International Building Code 2018 Philadelphia Edition  
NFPA 101 - Life Safety Code  
New Jersey UCC Fire Subcode 2021 (International Fire Code 2021 NJ Edition)  
NFPA 13 Standard for the Installation of Sprinkler Systems 2019  
Owner's Insurance Company  
Any other applicable codes.

- B. The contractor shall submit hydraulic calculations and shop drawings showing the system and its complete arrangement. Submitted drawings and calculations shall bear Underwriter approval stamp. Shop drawings and calculations shall be submitted to the local authority having jurisdiction, the Architect, the Engineer and the Owner's insurance company.
- C. Occupancy classification and coverage shall be as specified on the contract documents.

## **1.10 DEFINITIONS**

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe 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 in 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 plastic materials:
1. CPVC: Chlorinated polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL SYSTEM AND PRODUCT REQUIREMENTS**

- A. Sprinkler Systems: Conform work to NFPA 13.
- B. Welding Materials and Procedures: Conform to ASME Code.

### **2.02 BURIED PIPING**

- A. Cast Iron Pipe: AWWA C151/A21.51.
  1. Fittings: AWWA C110, standard thickness.
  2. Joints: AWWA C111, rubber gasket.
  3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.
  4. Provide thrust blocks at changes in direction, minimum 2 feet by 2 feet by 2 feet, minimum 2500 psi cast-in-place concrete.
  5. Piping shall have minimum 4'-0" cover below grade to top of pipe.

### **2.03 ABOVE GROUND PIPING**

- A. Steel Pipe: ASTM A 53 Schedule 40 or ASTM A 795 Schedule 40, black.
  1. Steel Fittings: ASME B16.9, wrought steel, butt welded, ASME B16.5, butt weld ends, ASTM A 234/A 234M, wrought carbon steel or alloy steel, ASME B16.5, steel flanges and fittings, or ASME B16.11, forged steel socket welded and threaded.
  2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
  3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A 47/A 47M.
  4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

5. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

B. Cast Iron Pipe: AWWA C151/A21.51.

1. Fittings: AWWA C110/A21.10, standard thickness.
2. Joints: AWWA C111, rubber gasket.
3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

## **2.04 PIPE HANGERS AND SUPPORTS**

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
- E. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
- F. Vertical Support: Steel riser clamp.
- G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- H. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

## **2.05 GATE VALVES**

- A. Up to and including 2 inches:
  1. Bronze body, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.
- B. Over 2 inches, under 4 inches:
  1. Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid bronze or cast iron wedge, flanged or grooved ends.

C. Over 4 inches:

1. Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly.

## **2.06 GLOBE OR ANGLE VALVES**

A. Up to and including 2 inches:

1. Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable rubber disc, threaded ends, with backseating capacity repackable under pressure.

B. Over 2 inches:

1. Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

## **2.07 BALL VALVES**

A. Up to and including 2 inches:

1. Bronze or Stainless steel two piece body, brass, chrome plated bronze, or stainless steel ball, Teflon seats and stuffing box ring, lever handle, threaded ends with union.

B. Over 2 inches:

1. Cast steel body, chrome plated steel ball, Teflon seat and stuffing box seals, lever handle or gear drive handwheel for sizes 10 inches and over, flanged.

## **2.08 BUTTERFLY VALVES**

A. Bronze Body:

1. Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and built-in tamper proof switch rated 10 amp at 115 volt AC.

B. Cast or Ductile Iron Body:

1. Cast or ductile iron, chrome or nickel plated ductile iron or aluminum bronze disc, resilient replaceable EPDM seat, wafer, lug, or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and external tamper switch rated 10 amp at 115 volt AC.

## **2.09 CHECK VALVES**

### **A. Up to and including 2 inches:**

1. Bronze body and swing disc, rubber seat, threaded ends.

### **B. Over 2 inches, under 4 inches:**

1. Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends.

### **C. 4 inches and Over:**

1. Iron body, bronze disc, stainless steel spring, resilient seal, threaded, wafer, or flanged ends.

## **2.10 DRAIN VALVES**

### **A. Compression Stop:**

1. Bronze with hose thread nipple and cap.

### **B. Ball Valve:**

1. Brass with cap and chain, 3/4 inch hose thread.

## **2.11 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.

2. Sealing Elements: EPDM and 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. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## **2.12 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.

## **2.13 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: Rough brass.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
  1. Finish: Rough brass.
- E. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- F. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

## **2.14 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, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### **3.02 INSTALLATION**

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Sleeve pipes passing through partitions, walls, and floors.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Inserts:
  1. Provide inserts for placement in concrete formwork.
  2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

H. Pipe Hangers and Supports:

1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  2. Place hangers within 12 inches of each horizontal elbow.
  3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
  5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  6. Provide copper plated hangers and supports for copper piping.
  7. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- I. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- K. Do not penetrate building structural members unless indicated.
- L. Provide sleeves when penetrating footings, floors, and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- M. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- N. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.



- O. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.
- P. Provide gate or butterfly valves for shut-off or isolating service.
- Q. Provide drain valves at main shut-off valves, low points of piping and apparatus.

### **3.03 PAINTING**

- A. Painting of fire-suppression systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### **3.04 ERECTION OF METAL SUPPORTS AND ANCHORAGES**

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

### **3.05 GROUTING**

- A. Mix and install grout for fire-suppression 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 on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

**END OF SECTION 210500**

## **SECTION 210529 - HANGERS AND SUPPORTS FOR FIRE PROTECTION PIPING AND EQUIPMENT**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. This Section includes the following hangers and supports for fire protection system piping and equipment:
  - 1. Steel pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Metal framing systems.
  - 4. Fastener systems.
  - 5. Equipment supports.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REQUIREMENTS**

- A. Hanging and supporting of sprinkler piping shall be in accordance with NFPA 13.

#### **1.04 PERFORMANCE REQUIREMENTS**

- A. Generally, hanger rings for pipe 2-inches and smaller shall be adjustable, Anvil Figure No. 101, or approved equal. Hanger rings for pipe 2-1/2-inches and larger shall be adjustable Anvil Figure No. 104 or 260, or approved equal. Clamps for supporting branch lines, piping 2-inches and smaller, shall be Anvil Figure No. 85 or 87, or approved equal. Clamps for supporting mains and all piping 2-1/2-inches to 8-inches shall be Anvil Figure No. 225, 226 or 27, or approved equal.
- B. Inserts for supporting pipes in concrete or masonry areas shall be malleable iron, galvanized steel or wrought steel of a design suitable for the floor construction which will permit adjustment in one direction and the removal or insertion of bolts or nuts so that different size hanger rods may be used. Inserts shall be of a design which will permit the use of the full strength of the bolt or hanger rod when installed in properly cured concrete. Inserts shall be of a type to finish flush with the surface of the concrete slab in a neat appearing and substantial manner and shall be Anvil Figure 282 or 280, or approved equal. Inserts shall not be used in precast concrete or in

concrete less than 3-1/2-inches in thickness. Expansion type anchors for use in concrete already in place shall be self-drilling type as manufactured by the Phillips Drill Company, or approved equal. Expansion type anchors for use in new construction may be used at the contractor's option.

- C. Branch lines 1-1/4-inches and smaller shall have at least one hanger for each length of pipe, with spacing of hangers not to exceed 12-feet. Branch lines and mains 1-1/2-inches and larger shall have at least one hanger for each length of pipe, with spacing of hangers not to exceed 15-feet. Where one hanger for each length of pipe would require hangers closer than 6-feet apart, hangers may be spaced not more than 12-feet apart. There shall be one hanger within 36-inches of the end sprinkler or lines and one hanger shall be placed not more than 30-inches from a change in direction for all piping. Hangers shall be placed 18-inches from the sprinkler; this is the preferred distance and shall be adhered to as closely as possible.
- D. Punching or drilling structural steel, except for intermediate steel provided specifically for support of piping, shall not be permitted. Supplementary steel for intermediate hangers shall be provided as required.
- E. Black steel pipe sleeves shall be provided where piping passes through concrete floors or interior walls. Wrought iron pipe sleeves shall be provided for pipes passing through floors poured in earth or exterior walls and such sleeves shall be caulked watertight. Sleeves passing through floor shall extend 1/2-inch above finished floor line, and shall be caulked with firestop material.
- F. Wall and ceiling plates shall be provided whenever pipes pass through walls or ceilings. Special high

## **1.05 SUBMITTALS**

- A. Product Data: For the following:
  - 1. Fire suppression pipe hangers and supports.
- 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. Equipment supports.

## **1.06 QUALITY ASSURANCE**

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel." and ASME Boiler and Pressure Vessel Code: Section IX.

## **PART 2 - PRODUCTS**

### **2.01 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.

### **2.02 STEEL PIPE HANGERS AND SUPPORTS**

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to NFPA 13 for where to use specific hanger and support types.
- B. Manufacturers:
1. AAA Technology & Specialties Co., Inc.
  2. Bergen-Power Pipe Supports.
  3. B-Line Systems, Inc.; a division of Cooper Industries.
  4. Carpenter & Paterson, Inc.
  5. Empire Industries, Inc.
  6. ERICO/Michigan Hanger Co.
  7. Globe Pipe Hanger Products, Inc.
  8. Grinnell Corp.
  9. GS Metals Corp.
  10. National Pipe Hanger Corporation.
  11. PHD Manufacturing, Inc.

12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

## **2.03 TRAPEZE PIPE HANGERS**

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts. Trapeze pipe hangers shall meet the requirements listed in NFPA 13, Chapter 9.

## **2.04 METAL FRAMING SYSTEMS**

- A. Description: MFMA-4, shop or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.

## **2.05 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.

1. Manufacturers:
  - a. Hilti, Inc.
  - b. ITW Ramset/Red Head.
  - c. Masterset Fastening Systems, Inc.
  - d. MKT Fastening, LLC.
  - e. Powers Fasteners.

## **2.06 EQUIPMENT SUPPORTS**

- A. Description: Welded, shop or field fabricated equipment support made from structural-steel shapes.

## **PART 3 - EXECUTION**

### **3.01 HANGER AND SUPPORT APPLICATIONS**

- A. Specific hanger and support requirements are specified in NFPA 13.
- 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 padded hangers for piping that is subject to scratching.
- E. Horizontal-Piping Hangers and Supports: Unless otherwise indicated in NFPA 13, 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. 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.
  3. 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).

4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
  5. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
  6. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2 (DN 15 to DN 50).
  7. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8 (DN 10 to DN 200).
  8. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3 (DN 10 to DN 80).
  9. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
  10. 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.
  11. 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 and with U-bolt to retain pipe.
  12. 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.
- F. Vertical-Piping Clamps: Unless otherwise indicated in NFPA 13, 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 20 (DN 20 to DN 500).
  2. Carbon or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.
- G. Hanger-Rod Attachments: Unless otherwise indicated in NFPA 13, and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
  2. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

H. Building Attachments: Unless otherwise indicated in NFPA 13, 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-joist 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.
  - b. Medium (MSS Type 32): 1500 lb.
  - c. Heavy (MSS Type 33): 3000 lb.



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.
- I. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
  - J. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
  - K. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

### **3.02 HANGER AND SUPPORT INSTALLATION**

- A. Steel Pipe Hanger Installation: Comply with NFPA 13, MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with NFPA 13, 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 above for individual pipe hangers.
  2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- D. Fastener System Installation:
  1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches 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.
- E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- F. Equipment Support Installation: Fabricate from welded-structural-steel shapes for interior application.
- G. Install hangers and supports to allow controlled 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.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. 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.
- J. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

### **3.03 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 smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

### **3.04 METAL FABRICATIONS**

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

### **3.05 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.

**END OF SECTION 210529**

## **SECTION 210553 - IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe Markers.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers.

#### **1.04 SUBMITTALS**

- A. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Samples: Submit two labels and two valve tags.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- F. Project Record Documents: Record actual locations of tagged valves.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Brady Corporation
- B. Champion America, Inc.
- C. Seton Identification Products
- D. Marking Services, Inc. (MSI)

### **2.02 NAMEPLATES**

- A. Description: Laminated three-layer plastic with engraved letters.
  - 1. Letter Color: White.
  - 2. Letter Height: 1/2 inch.
  - 3. Background Color: Black, red, green, yellow, or as directed.

### **2.03 TAGS**

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- C. Chart: Typewritten letter size list in anodized aluminum frame.

### **2.04 STENCILS**

- A. Stencils: With clean cut symbols and letters of following size:
  - 1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
  - 2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
  - 3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.

4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
  5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
  6. Equipment: 2-1/2 inch high letters.
- B. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.

## **2.05 PIPE MARKERS**

- A. Color: Conform to ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

## **2.06 CEILING TACKS**

- A. Description: Steel with 3/4 inch diameter color coded head.
- B. Color code as follows:
  1. Red - Sprinkler valves

# **PART 3 - EXECUTION**

## **3.01 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive for identification materials.

## **3.02 INSTALLATION**

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.

- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Identify pumps and valves with plastic nameplates or stencil painting. Small devices, such as in-line pumps, may be identified with tags.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify valves in main and branch piping with tags.
- I. Identify piping, concealed or exposed, with stenciled painting. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- J. Provide ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

**END OF SECTION 210553**

## **SECTION 211300 - FIRE SUPPRESSION SPRINKLER SYSTEMS**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Wet-pipe sprinkler system.
- B. System design, installation, and certification.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.
- B. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.
- C. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association.
- D. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- B. Shop Drawings:
  - 1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
  - 2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
  - 3. Submit shop drawings, product data, and hydraulic calculations to authority having jurisdiction for approval. Submit proof of approval to Architect.



- C. Samples: Submit two of each style of sprinkler specified.
- D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.
- E. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.
- F. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

#### **1.05 QUALITY ASSURANCE**

- A. Maintain one copy of referenced design and installation standard on site.
- B. Conform to UL, FM or ITS (Warnock Hersey) requirements.
- C. Design system under direct supervision of a Professional Engineer or Professional Fire Protection Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- E. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.
- F. Equipment and Components: Provide products that bear UL, FM or ITS (Warnock Hersey) label or marking.
- G. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

#### **1.06 MOCK-UP**

- A. Provide components for installation in mock-up.
- B. Mock-up may not remain as part of the Work.

#### **1.07 PRE-INSTALLATION MEETING**

- A. Convene one week before starting work of this section.

## **1.08 DELIVERY, STORAGE, AND PROTECTION**

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

## **1.09 EXTRA MATERIALS**

- A. Provide extra sprinklers of type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
- B. Provide suitable wrenches for each sprinkler type.
- C. Provide metal storage cabinet in location designated.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Sprinklers shall be UL listed/FM approved, with 175 psig minimum pressure rating.
- B. Manufacturers:
  - 1. AFAC Inc.
  - 2. Central Sprinkler Corp.
  - 3. Firematic Sprinkler Devices, Inc.
  - 4. Globe Fire Sprinkler Corporation
  - 5. Grinnell Fire Protection
  - 6. Reliable Automatic Sprinkler Co., Inc.
  - 7. Star Sprinkler Inc.
  - 8. Venus Fire Protection, Ltd.
  - 9. Victaulic Co. of America
  - 10. Viking Corp.

## **2.02 SPRINKLER SYSTEM REQUIREMENTS**

- A. Sprinkler System: Provide coverage for [entire building], [building areas noted].
- B. Occupancy and Coverage: As indicated on the drawings.
- C. Water Supply: Determine volume and pressure from water flow test data.
- D. Interface system with building fire and smoke alarm system.
- E. Provide fire department connections where indicated.

## **2.03 SPRINKLERS**

- A. Suspended Ceiling Type: Semi-recessed or concealed pendant type with matching push on or clamp on escutcheon plate.
  - 1. Finish: Chrome plated.
  - 2. Escutcheon Plate Finish: Chrome plated.
  - 3. Fusible Link: Fusible solder link type or glass bulb type temperature rated for specific area hazard.
- B. Exposed Area Type: Standard upright type with guard, in stairwell, mechanical rooms and storage areas.
  - 1. Finish: Chrome plated.
  - 2. Fusible Link: Fusible solder link type or Glass bulb type temperature rated for specific area hazard.
- C. Sidewall Type: Semi-recessed or recessed horizontal sidewall type with matching push on, clamp on or screw on escutcheon plate and guard.
  - 1. Finish: Chrome plated.
  - 2. Escutcheon Plate Finish: Chrome plated.
  - 3. Fusible Link: Fusible solder link type or glass bulb type temperature rated for specific area hazard.
- D. Guards: Finish to match sprinkler finish.

## **2.04 PIPING SPECIALTIES**

- A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm and electric alarm, with pressure retard chamber and variable pressure trim; with test and drain valve.
- B. Electric Alarm: Electrically operated red enameled gong with pressure alarm switch.
- C. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.
- D. Supervisory Switches: As indicated on the drawings.
- E. Air Pressure Supervisory Switches: As indicated on the drawings.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Install buried shut-off valves in valve box. Provide post indicator.
- D. Provide approved backflow preventer assembly at sprinkler system water source connection.
- E. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent Siamese connectors to allow full swing of fire department wrench handle.
- F. Locate outside alarm gong on building wall as indicated.
- G. Place pipe runs to minimize obstruction to other work.
- H. Place piping in concealed spaces above finished ceilings.
- I. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.
- J. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- K. Install and connect to fire pump system in accordance with NFPA 13.

- L. Install air compressor on vibration isolators.
- M. Flush entire piping system of foreign matter.
- N. Install guards on sprinklers in mechanical rooms.
- O. Hydrostatically test entire system.
- P. Require test be witnessed by authority having jurisdiction.
- Q. Provide the services of a competent instructor to instruct and train the Owner's staff in the proper operation of the system.
- R. Provide connection from the building sprinkler system to the kitchen hood fire protection system. Size piping in accordance with hood manufacturer's requirements.
- S. Shielded rooms and enclosures, such as MRI suites, shall have no more than one penetration. Provide shielding continuity at penetration.
- T. All interruptions to fire protection system, water service, electricity or fire alarm system shall be scheduled with the Owner, at least one week in advance of the planned shutdown.
- U. On renovation projects, sprinkler heads indicated to be relocated shall be new sprinkler heads, installed in the new locations, by extending existing branch piping to the new locations. Reroute and extend branch piping as required to accommodate new conditions. Reuse of existing sprinkler heads is prohibited.

### **3.02 INTERFACE WITH OTHER PRODUCTS**

- A. Ensure required devices are installed and connected as required to fire alarm system.

**END OF SECTION 211300**

## **SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.02 SUMMARY**

- A. This Section includes the following hangers and supports for plumbing system piping and equipment:
  - 1. Steel pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Metal framing systems.
  - 4. Thermal-hanger shield inserts.
  - 5. Fastener systems.
  - 6. Pipe stands.
  - 7. Pipe positioning systems.
  - 8. Equipment supports.

#### **1.03 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.04 REFERENCES**

- A. ASME B31.9 - Building Services Piping; American Society of Mechanical Engineers.
- B. ASME BPV (IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; American Society of Mechanical Engineers.
- C. ASTM A36/A36M - Carbon Structural Steel; American Society for Testing and Materials.

- D. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; American Society for Testing and Materials.
- E. ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation; American Society for Testing and Materials.
- F. ASTM C1107 - Packaged Dry, Hydraulic-Cement Grout (Non-shrink); American Society for Testing and Materials.
- G. AWS D1.1 - Structural Welding Code - Steel; American Welding Society.
- H. AWS D1.2 - Structural Welding Code - Aluminum; American Welding Society.
- I. AWS D1.4 - Structural Welding Code - Reinforcing Steel; American Welding Society.
- J. MFMA-4 - Metal Framing Standards; Metal Framing Manufacturers Association.
- K. MFMA-103 - Guidelines for the Use of Metal Framing; Metal Framing Manufacturers Association.
- L. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry.
- M. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry.
- N. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry.
- O. SSPC-PA1 - Paint Application Standard for Shop, Field and Maintenance Painting of Steel; Society for Protective Coatings; latest edition.

## **1.05 DEFINITIONS**

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

## **1.06 PERFORMANCE REQUIREMENTS**

- A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

## **1.07 SUBMITTALS**

- A. Product Data: For the following:
  - 1. Steel pipe hangers and supports.
  - 2. Thermal-hanger shield inserts.
  - 3. Powder-actuated fastener systems.
  - 4. 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. Pipe stands. Include Product Data for components.
  - 4. Equipment supports.

## **1.08 QUALITY ASSURANCE**

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel." and ASME Boiler and Pressure Vessel Code: Section IX.
- 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 D1.4, "Structural Welding Code-Reinforcing Steel."
  - 4. ASME Boiler and Pressure Vessel Code: Section IX.



## **PART 2 - PRODUCTS**

### **2.01 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.

### **2.02 STEEL PIPE HANGERS AND SUPPORTS**

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
1. AAA Technology & Specialties Co., Inc.
  2. Bergen-Power Pipe Supports.
  3. B-Line Systems, Inc.; a division of Cooper Industries.
  4. Carpenter & Paterson, Inc.
  5. Empire Industries, Inc.
  6. ERICO/Michigan Hanger Co.
  7. Globe Pipe Hanger Products, Inc.
  8. Grinnell Corp.
  9. GS Metals Corp.
  10. National Pipe Hanger Corporation.
  11. PHD Manufacturing, Inc.

12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

- C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

### **2.03 TRAPEZE PIPE HANGERS**

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

### **2.04 METAL FRAMING SYSTEMS**

- A. Description: MFMA-4, shop or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Manufacturers:
  1. B-Line Systems, Inc.; a division of Cooper Industries.
  2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
  3. GS Metals Corp.
  4. Power-Strut Div.; Tyco International, Ltd.
  5. Thomas & Betts Corporation.
  6. Tolco Inc.
  7. Unistrut Corp.; Tyco International, Ltd.
- C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

## **2.05 THERMAL-HANGER SHIELD INSERTS**

- A. Description: 100-psig minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Manufacturers:
  - 1. Carpenter & Paterson, Inc.
  - 2. ERICO/Michigan Hanger Co.
  - 3. PHS Industries, Inc.
  - 4. Pipe Shields, Inc.
  - 5. Rilco Manufacturing Company, Inc.
  - 6. Value Engineered Products, Inc.
- C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate.
- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

## **2.06 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.
  - 1. Manufacturers:
    - a. Hilti, Inc.
    - b. ITW Ramset/Red Head.

- c. Masterset Fastening Systems, Inc.
  - d. MKT Fastening, LLC.
  - e. Powers Fasteners.
- B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
  - 1. Manufacturers:
    - a. B-Line Systems, Inc.; a division of Cooper Industries.
    - b. Empire Industries, Inc.
    - c. Hilti, Inc.
    - d. ITW Ramset/Red Head.
    - e. MKT Fastening, LLC.
    - f. Powers Fasteners.

## **2.07 PIPE STAND FABRICATION**

- A. Pipe Stands, General: 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.
  - 1. Manufacturers:
    - a. ERICO/Michigan Hanger Co.
    - b. MIRO Industries.
- C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.
  - 1. Manufacturers:
    - a. MIRO Industries.

- D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

1. Manufacturers:

- a. ERICO/Michigan Hanger Co.
- b. MIRO Industries.
- c. Portable Pipe Hangers.

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. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

1. Manufacturers:

- a. Portable Pipe Hangers.

2. Bases: One or more plastic.

3. Vertical Members: Two or more protective-coated-steel channels.

4. Horizontal Member: Protective-coated-steel channel.

5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

- F. Curb-Mounting-Type Pipe Stands: Shop or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

## 2.08 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Manufacturers:

1. C & S Mfg. Corp.
2. HOLDRITE Corp.; Hubbard Enterprises.
3. Samco Stamping, Inc.

## **2.09 EQUIPMENT SUPPORTS**

- A. Description: Welded, shop or field-fabricated equipment support made from structural-steel shapes.

## **2.10 ROOFTOP EQUIPMENT SUPPORTS**

- A. Description: Monolithic construction, 18 gauge galvanized steel, continuous mitered and welded corner seams, integral base plate, factory installed wood nailer, and 18 gauge galvanized steel counterflashing.
- B. Manufacturers:
  1. Pate
  2. Roof Products and Systems Corp.
  3. ThyCurb

## **2.11 MISCELLANEOUS MATERIALS**

- A. Structural Steel: ASTM A 36/A 36M, 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, 28-day compressive strength.

## **PART 3 - EXECUTION**

### **3.01 HANGER AND SUPPORT APPLICATIONS**

- A. Specific hanger and support requirements are specified 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 padded hangers for piping that is subject to scratching.
- F. 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 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches of insulation.
  - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches 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 2 (DN 15 to DN 50).

10. Split Pipe-Ring with or without Turnbuckle-Adjustment 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 2-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.
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 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 2 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 20 (DN 65 to DN 500), 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.



G. 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 20 (DN 20 to DN 500).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.

H. 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 for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F 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 piping installations.

I. 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-joist 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.
  - b. Medium (MSS Type 32): 1500 lb.
  - c. Heavy (MSS Type 33): 3000 lb.
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.
- J. 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.
- K. 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.
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 absorb 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 absorb 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 absorb 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.
- L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- M. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.
- O. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

### **3.02 HANGER AND SUPPORT INSTALLATION**

- A. Steel 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 building structure.
- B. 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 above for individual pipe hangers.
  - 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- 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 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-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
  - 2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 Section "Roof Accessories" for curbs.
- G. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

- H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- I. Equipment Support Installation: Fabricate from welded-structural-steel shapes for interior application. Install rooftop equipment supports per manufacturer's instructions.
- J. 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.
- K. Install lateral bracing with pipe hangers and supports to prevent swaying.
- L. 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.
- M. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.
- O. Insulated Piping: Comply with the following:
  - 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. Provide continuous vapor barrier.
    - c. Do not exceed pipe stress limits according to 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 long and 0.048 inch thick.
  - b. NPS 4 (DN 100): 12 inches long and 0.06 inch thick.
  - c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches long and 0.06 inch thick.
  - d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches long and 0.075 inch thick.
  - e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches long and 0.105 inch thick.
5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### **3.03 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 smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

### **3.04 METAL FABRICATIONS**

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

### **3.05 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.

### **3.06 PAINTING**

- A. Touch Up: 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 minimum dry film thickness of 2.0 mils.
- B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal as specified.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

**END OF SECTION 220529**

## **SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe Markers.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers.

#### **1.04 SUBMITTALS**

- A. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Samples: Submit two labels and tags.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- F. Project Record Documents: Record actual locations of tagged valves.

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Brady Corporation



- B. Champion America, Inc.
- C. Seton Identification Products
- D. Marking Services Inc.

## **2.02 NAMEPLATES**

- A. Description: Laminated three-layer plastic with engraved letters.
  - 1. Letter Color: White.
  - 2. Letter Height: Minimum 1/4 inch.
  - 3. Background Color: Black.

## **2.03 TAGS**

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Metal Tags: Stainless steel with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- C. Chart: Typewritten letter size list in anodized aluminum frame.

## **2.04 STENCILS**

- A. Stencils: With clean cut symbols and letters of following size:
  - 1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
  - 2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
  - 3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
  - 4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
  - 5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.

6. Equipment: 2-1/2 inch high letters.

B. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.

## **2.05 PIPE MARKERS**

A. Color: Conform to ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

## **2.06 CEILING TACKS**

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:

1. Green - Plumbing valves and equipment.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

A. Degrease and clean surfaces to receive adhesive for identification materials.

### **3.02 INSTALLATION**

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Identify pumps, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify valves in main and branch piping with tags.
- I. Identify piping, concealed or exposed, with plastic tape pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- J. Provide ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

**END OF SECTION 220553**

## **SECTION 220716 - PLUMBING EQUIPMENT INSULATION**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Equipment insulation.
- B. Covering.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- D. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- E. ASTM C 195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
- F. ASTM C 449/C 449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
- G. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- H. ASTM C 533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
- I. ASTM C 534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- J. ASTM C 552 - Standard Specification for Cellular Glass Thermal Insulation.

- K. ASTM C 553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- L. ASTM C 592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type).
- M. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- N. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- O. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials.
- P. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association.
- Q. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for equipment scheduled.
- B. Samples: Submit two samples of any representative size illustrating each insulation type.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

#### **1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

## **1.07 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

## **PART 2 - PRODUCTS**

### **2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

### **2.02 GLASS FIBER, FLEXIBLE**

- A. Manufacturers:
  - 1. Knauf Fiber Glass;
  - 2. Johns Manville Corporation;
  - 3. Owens Corning Corp;
  - 4. CertainTeed Corporation;
- B. Insulation: ASTM C 553; flexible, noncombustible.
  - 1. 'K' Value: 0.36 at 75 degrees F, when tested in accordance with ASTM C 177 or ASTM C 518.
  - 2. Maximum Service Temperature: 850 degrees F.
  - 3. Maximum Water Vapor Sorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
  - 1. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E 96/E 96M.
  - 2. Secure with self-sealing longitudinal laps and butt strips.
  - 3. Secure with outward clinch expanding staples and vapor barrier mastic.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive:

1. Compatible with insulation.

F. Insulating Cement/Mastic:

1. ASTM C 195; hydraulic setting on mineral wool.

## **2.03 GLASS FIBER, RIGID**

A. Manufacturer:

1. Knauf Fiber Glass
2. Johns Manville Corporation
3. Owens Corning Corp.
4. CertainTeed Corporation;

B. Insulation: ASTM C 612 or ASTM C 592; rigid, noncombustible.

1. 'K' Value: 0.25 at 75 degrees F, when tested in accordance with ASTM C 177 or ASTM C 518.
2. Maximum Service Temperature: 850 degrees F.
3. Maximum Water Vapor Sorption: 5.0 percent by weight.
4. Maximum Density: 12.0 lb./cu ft.

C. Vapor Barrier Jacket:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E 96/E 96M.
3. Secure with self-sealing longitudinal laps and butt strips.
4. Secure with outward clinch expanding staples and vapor barrier mastic.

- D. Facing: 1 inch galvanized or stainless steel hexagonal wire mesh stitched on one face of insulation.
- E. Vapor Barrier Lap Adhesive:
  - 1. Compatible with insulation.
- F. Insulating Cement/Mastic:
  - 1. ASTM C 195; hydraulic setting on mineral wool.

## **2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION**

- A. Manufacturer:
  - 1. Armacell International
  - 2. Rubatex
  - 3. Halstead
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C 534 Grade 3, in sheet form.
  - 1. Minimum Service Temperature: -40 degrees F.
  - 2. Maximum Service Temperature: 220 degrees F.
  - 3. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

## **2.05 JACKETS**

- A. Aluminum Jacket: ASTM B 209 (ASTM B 209M) formed aluminum sheet.
  - 1. Thickness: 0.016 inch sheet.
  - 2. Finish: Smooth.
  - 3. Joining: Longitudinal slip joints and 2 inch laps.
  - 4. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.



5. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.
- B. Stainless Steel Jacket: ASTM A 666, Type 304 stainless steel.
  1. Thickness: 0.010 inch.
  2. Finish: Smooth.
  3. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that equipment has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.
- C. Insulation on existing piping, ductwork and equipment disturbed by the new work shall be repaired and finished to match original new condition.

#### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Factory Insulated Equipment: Do not insulate.
- C. Exposed Equipment: Locate insulation and cover seams in least visible locations.
- D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
- E. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.
- F. Insulated equipment containing fluids below ambient temperature: Insulate entire system.
- G. Fiber glass insulated equipment containing fluids below ambient temperature: Provide vapor barrier jackets, factory-applied or field-applied. Finish with glass cloth and vapor barrier adhesive.
- H. For hot equipment containing fluids 140 degrees F or less, do not insulate flanges and unions, but bevel and seal ends of insulation.

- I. For hot equipment containing fluids over 140 degrees F, insulate flanges and unions with removable sections and jackets.
- J. Fiber glass insulated equipment containing fluids above ambient temperature: Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Finish with glass cloth and adhesive.
- K. Inserts and Shields:
  - 1. Application: Equipment 1-1/2 inches diameter or larger.
  - 2. Shields: Galvanized steel between hangers and inserts.
  - 3. Insert location: Between support shield and equipment and under the finish jacket.
  - 4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
  - 5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- L. Finish insulation at supports, protrusions, and interruptions.
- M. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with stainless steel jacket.
- N. Exterior Applications: Provide vapor barrier jacket or finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal equipment.
- O. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.
- P. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

### **3.03 SCHEDULES**

- A. All Plumbing Systems are to have insulation thickness and type according to the Insulation Schedule on the drawings.
- B. At contractor's option, equivalent thickness of elastomeric foam or glass foam insulation may be used in lieu of fiberglass, at appropriate temperatures.

**END OF SECTION 220716**

## **SECTION 220717 - PIPING SAFETY COVERS**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Piping Safety Covers.
- B. Lavatory Piping Enclosure.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council.
- B. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- C. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
- D. ASTM D 2240 - Standard Test Method for Rubber Property--Durometer Hardness.
- E. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Underwriters Laboratories Inc.

#### **1.04 SUBMITTALS**

- A. Product Data: Manufacturer's descriptive literature for products specified in this section.
- B. Shop Drawings: Indicate locations and configurations of piping insulation for indicated plumbing configurations.
- C. Manufacturer's printed installation instructions for each specified product.

## **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Store products of this section in manufacturer's unopened packaging until installation; maintain storage conditions for products in accordance with manufacturer's recommendations.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Acceptable Manufacturer: Truebro, Inc.

### **2.02 PIPING INSULATION ACCESSORIES**

- A. Provide products that comply with the following:
  - 1. Americans With Disabilities Act (ADA), Article 4.19.4.
  - 2. ANSI/ICC A 117.1, American National Standard for Accessible Buildings and Facilities.
  - 3. BOCA Basic Building Code.
  - 4. Requirements of applicable building code.
- B. Piping Safety Covers: Truebro Lav-Guard.
  - 1. Characteristics: Three-piece molded assembly, minimum 1/8 inch wall thickness, with internal ribs to provide air space between piping and piping insulation jacket, molded to receive manufacturer's snap-clip fasteners.
  - 2. Vinyl Material: Impact-resistant and stain-resistant molded closed-cell anti-microbial vinyl compound, UV-stable, non-fading, non yellowing, having the following performance characteristics:
    - a. Burning Characteristics: 0 seconds Average Time of Burning (ATB), 0 mm Area of Burning (AEB), when tested in accordance with ASTM D 635.
    - b. Thermal Conductivity: K-value 1.17 (2.02), when tested in accordance with ASTM D 2240, using Type A durometer.
  - 3. Trap Assembly Cover: Three-piece assembly, with removable clean-out nut enclosure.

4. Angle Stop Covers: Formed with hinged cap for access to valve without requiring cove removal.
5. Configurations: In accordance with manufacturer's product data for project piping configurations indicated on drawings.
6. Color: Paintable.
7. Fasteners: Manufacturer's standard re-usable snap-clip fasteners, wire-tie fasteners not permitted.

C. Lavatory Piping Enclosure: Truebro Lav-Shield.

1. Characteristics: One-piece rigid molded vinyl enclosure, minimum 1/8 inch wall thickness, factory-punched for manufacturer's wall fasteners.
2. Vinyl Material: Impact-resistant and stain-resistant molded closed-cell vinyl, having the following performance characteristics:
  - a. Burning Characteristics: 0 seconds Average Time of Burning (ATB), 0 mm Area of Burning (AEB), when tested in accordance with ASTM D 635.
  - b. Flammability: UL 94 V-O rating.
  - c. Indentation Hardness: 69, minimum, when tested in accordance with ASTM D 2240, using Type A durometer.
3. Vinyl Color: China White, fine-textured finish, paintable.
4. Fasteners: Manufacturer's standard stainless steel wall fasteners with tamper-resistant heads.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that piping configurations are correct type for piping cover component configurations specified.

### **3.02 INSTALLATION**

- A. Install products of this section in accordance with manufacturer's printed installation instructions.

### **3.03 PROTECTION OF INSTALLED PRODUCTS**

- A. Do not allow damage to installed products by subsequent construction activities; protect products until Substantial Completion.

**END OF SECTION 220717**

## **SECTION 220719 - PLUMBING PIPING INSULATION**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Piping insulation.
- B. Jackets and accessories.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- D. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.
- E. ASTM C 195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
- F. ASTM C 449/C 449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
- G. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- H. ASTM C 533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
- I. ASTM C 534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- J. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation.
- K. ASTM C 552 - Standard Specification for Cellular Glass Thermal Insulation.

- L. ASTM C 585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
- M. ASTM C 795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
- N. ASTM D 1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber.
- O. ASTM D 2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
- P. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- Q. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials.
- R. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association.
- S. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Samples: Submit two samples of any representative size illustrating each insulation type.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

#### **1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.



## **1.07 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

## **PART 2 - PRODUCTS**

### **2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

### **2.02 GLASS FIBER**

- A. Manufacturers:
  - 1. Knauf Fiber Glass
  - 2. Johns Manville Corporation
  - 3. Owens Corning Corp.
  - 4. CertainTeed Corporation;
- B. Insulation: ASTM C 547 and ASTM C 795; rigid molded, noncombustible.
  - 1. 'K' value: ASTM C 177, 0.24 at 75 degrees F.
  - 2. Maximum service temperature: 850 degrees F.
  - 3. Maximum moisture absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96/E 96M of 0.02 perm-inches.
- D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- E. Vapor Barrier Lap Adhesive:
  - 1. Compatible with insulation.

F. Insulating Cement/Mastic:

1. ASTM C 195; hydraulic setting on mineral wool.

G. Fibrous Glass Fabric:

1. Cloth: Untreated; 9 oz/sq. yd. weight.
2. Blanket: 1.0 lb./cu. ft. density.
3. Weave: Maximum 10 x 20.

H. Indoor Vapor Barrier Finish:

1. Cloth: Untreated; 9 oz/sq. yd. weight.
2. Vinyl emulsion type acrylic, compatible with insulation, black color.

I. Outdoor Vapor Barrier Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

J. Outdoor Breather Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

K. Insulating Cement:

1. ASTM C 449/C 449M.

## **2.03 HYDROUS CALCIUM SILICATE**

A. Manufacturers:

1. Johns Manville Corporation

B. Insulation: ASTM C 533 and ASTM C 795; rigid molded, asbestos free, gold color.

1. 'K' value: ASTM C 177 and C518; 0.40 at 300 degrees F, when tested in accordance with ASTM C 177 or ASTM C 518.
2. Maximum service temperature: 1200 degrees F.
3. Density: 15 lb./cu. ft.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D. Insulating Cement:

1. ASTM C 449/C 449M.

## **2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION**

A. Manufacturer:

1. Armacell International
2. Rubatex
3. Halstead

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C 534, use molded tubular material wherever possible.

1. Minimum Service Temperature: -40 degrees F.
2. Maximum Service Temperature: 220 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

## **2.05 JACKETS**

A. Stainless Steel Jacket: ASTM A 666, Type 304 stainless steel.

1. Thickness: Minimum 0.010 inch.
2. Finish: Smooth.
3. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

## **2.06 HANDICAPPED-ACCESSIBLE LAVATORY INSULATION**

A. At contractor's option, flexible pipe insulation with PVC jacket may be used for trap and hot and cold piping exposed at lavatory.

B. Insulation shall be McGuire Pro-Wrap, Brocar Products Trap Wrap, TCI Products Skal-Gard, or approved equal.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
  - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- H. Glass fiber insulated pipes conveying fluids above ambient temperature:
  - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
  - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

I. Inserts and Shields:

1. Application: Piping 1-1/2 inches diameter or larger.
  2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  3. Insert location: Between support shield and piping and under the finish jacket.
  4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
  5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.
- K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with stainless steel jacket.
- L. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.
- M. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with stainless steel jacket with seams located on bottom side of horizontal piping.
- N. Insulation at grooved-end pipe couplings and flanged connections shall be full thickness of adjacent pipe insulation. Seal ends of insulation sections to provide continuous vapor barrier.
- O. Piping exposed to weather or ambient conditions, such as crawl space, shall be provided with additional 1 inch thickness of insulation.
- P. Piping insulated with fiberglass, cellular glass or calcium silicate, and exposed to weather, shall receive metal jacket.
- Q. Piping insulated with cellular foam, and exposed to weather, shall receive one coat of manufacturer's ultra-violet resistant coating.
- R. Insulation on existing piping and equipment disturbed by the new work shall be repaired and finished to match the original new condition.

### **3.03 SCHEDULES**

- A. All Plumbing Systems shall follow Insulation Schedules on the drawings.

**END OF SECTION 220719**

## **SECTION 221005 - PLUMBING PIPING**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Pipe, pipe fittings, valves, and connections for piping systems.
  - 1. Sanitary sewer.
  - 2. Domestic water.
  - 3. Storm water.
  - 4. Gas.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; The American Society of Mechanical Engineers.
- C. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers.
- D. ASME B16.4 - Gray Iron Threaded Fittings; The American Society of Mechanical Engineers.
- E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; (ANSI B16.18).
- F. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.
- G. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers.

- H. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; The American Society of Mechanical Engineers.
- I. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers.
- J. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers; (ANSI/ASME B31.1).
- K. ASME B31.2 - Fuel Gas Piping; The American Society of Mechanical Engineers.
- L. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; (ANSI/ASME B31.9).
- M. ASME (BPV IV) - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; The American Society of Mechanical Engineers.
- N. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers.
- O. ASTM A 47/A 47M - Standard Specification for Ferritic Malleable Iron Castings.
- P. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- Q. ASTM A 74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
- R. ASTM A 234/A 234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
- S. ASTM B 32 - Standard Specification for Solder Metal.
- T. ASTM B 42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
- U. ASTM B 43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes.
- V. ASTM B 68 - Standard Specification for Seamless Copper Tube, Bright Annealed.
- W. ASTM B 68M - Standard Specification for Seamless Copper Tube, Bright Annealed (Metric).
- X. ASTM B 75 - Standard Specification for Seamless Copper Tube.
- Y. ASTM B 75M - Standard Specification for Seamless Copper Tube (Metric).



- Z. ASTM B 88 - Standard Specification for Seamless Copper Water Tube.
- AA. ASTM B 88M - Standard Specification for Seamless Copper Water Tube (Metric).
- AB. ASTM B 280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
- AC. ASTM B 306 - Standard Specification for Copper Drainage Tube (DWV).
- AD. ASTM C 564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- AE. ASTM C 1053 - Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications.
- AF. ASTM D 1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- AG. ASTM D 2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
- AH. ASTM D 2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
- AI. ASTM D 2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter.
- AJ. ASTM D 2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
- AK. ASTM D 2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe.
- AL. ASTM D 2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
- AM. ASTM D 2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- AN. ASTM D 2846/D 2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems.
- AO. ASTM D 2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

- AP. ASTM D 3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- AQ. ASTM F 437 - Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- AR. ASTM F 438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
- AS. ASTM F 439 - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- AT. ASTM F 441/F 441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
- AU. ASTM F 442/F 442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR).
- AV. ASTM F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- AW. ASTM F 493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- AX. ASTM F 679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
- AY. ASTM F 708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
- AZ. ASTM F 1281 - Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe.
- BA. ASTM F 1282 - Standard Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe.
- BB. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society.
- BC. AWS D10 - Welding and Brazing Qualifications, American Welding Society.
- BD. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; American Water Works Association; (ANSI/AWWA C105/A21.5).

- BE. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association; (ANSI/AWWA C111/A21.11).
- BF. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association; (ANSI/AWWA C151/A21.51).
- BG. AWWA C651 - Disinfecting Water Mains; American Water Works Association; (ANSI/AWWA C651).
- BH. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute.
- BI. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute.
- BJ. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc..
- BK. MSS SP-67 - Butterfly Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- BL. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- BM. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- BN. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- BO. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- BP. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- BQ. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- BR. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.

- BS. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- BT. NFPA 54 - National Fuel Gas Code; National Fire Protection Association.
- BU. NFPA 58 - Liquefied Petroleum Gas Code; National Fire Protection Association.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- B. Project Record Documents: Record actual locations of valves.

#### **1.05 QUALITY ASSURANCE**

- A. Perform Work in accordance with State of New Jersey, City of Camden standards.
  - 1. Maintain one copy on project site.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.
- D. Welders Certification: In accordance with ASME (BPV IX) or AWS D10.
- E. Identify pipe with marking including size, material classification, specification, potable water certification, water pressure rating.

#### **1.06 REGULATORY REQUIREMENTS**

- A. Perform Work in accordance with State of New Jersey plumbing code.
- B. Conform to applicable code for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

#### **1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

## **1.08 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install underground piping when bedding is wet or frozen.

## **1.09 EXTRA MATERIALS**

- A. Provide two repacking kits for each size valve.

## **PART 2 - PRODUCTS**

### **2.01 SANITARY SEWER PIPING, ABOVE GRADE**

- A. Cast Iron Pipe: ASTM A 74, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joint Seals: ASTM C 564 neoprene gaskets, or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. Copper Tube: ASTM B 306, DWV.
  - 1. Fittings: ASME B16.29, wrought copper.
  - 2. Joints: ASTM B 32, alloy Sn50 solder.
- D. Brass Pipe: ASTM B 43, chrome plated.
  - 1. Fittings: ASME B16.23, cast bronze, chrome plated.
  - 2. Joints: Mechanical compression.

## **2.02 CHEMICAL RESISTANT SEWER PIPING**

- A. Glass Pipe: ASTM C 1053.
  - 1. Fittings: ASTM C 1053.
  - 2. Joints: Stainless steel compression couplings with tetra-fluoroethylene seal ring.
- B. FRPP Pipe: Fire Retardant Polypropylene.
  - 1. Fittings: Fire Retardant Polypropylene grooved or socket.
  - 2. Joints: Mechanical steel band and grooved joints or electrical resistance socket fusion.

## **2.03 WATER PIPING, ABOVE GRADE**

- A. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B) or K (A), Drawn (H).
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B 32, alloy Sn95 solder or approved compression joints.

## **2.04 STORM WATER PIPING, ABOVE GRADE**

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

## **2.05 NATURAL GAS PIPING, ABOVE GRADE**

- A. Steel Pipe: ASTM A 53/A 53M Schedule 40 black.
  - 1. Fittings: ASME B16.3, malleable iron, or ASTM A 234/A 234M, wrought steel welding type.
  - 2. Joints: NFPA 54, threaded or welded to ASME B31.1, ASME B31.2, ASME B31.9, or ASME (BPV IX).

- B. CSST: Corrugated Stainless Steel Tubing: ANSI LC1 and ICC-ES PMG LC1027, ASTM A240, type 304 annealed stainless steel, listed by CSA International, Certification Number 2728525, ICC Evaluation Services, Report Number PMG-1019.
  - 1. Fittings: Mechanical tube fittings manufactured from ASTM B16 type 360 brass, double wall flared gas-tight seal with mechanical captured jacket, ASME B1.20.1 threads.
  - 2. Joints: NFPA 54, threaded to ASME B31.2
  - 3. Coating: Factory applied, UV-Resistant polyethylene coating, ASTM E84 of (25) for flame spread and (50) for smoke density.

## **2.06 FLANGES, UNIONS, AND COUPLINGS**

- A. Unions for Pipe Sizes 2 Inches and Under:
  - 1. Ferrous pipe: Class 150 malleable iron threaded unions.
  - 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch:
  - 1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
  - 2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Grooved and Shouldered Pipe End Couplings:
  - 1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
  - 2. Sealing gasket: "C" shape composition sealing gasket.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

## **2.07 PIPE HANGERS AND SUPPORTS**

- A. Plumbing Piping - Drain, Waste, and Vent:
  - 1. Conform to ASME B31.9, ASTM F 708, MSS SP-58, MSS SP-69, or MSS SP-89.

2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Carbon steel, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

B. Plumbing Piping - Water:

1. Conform to ASME B31.9, ASTM F 708, MSS SP-58, MSS SP-69, or MSS SP-89.
2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Carbon steel, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
6. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded supports or spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
9. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.



10. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

## **2.08 GATE VALVES**

### **A. Manufacturers:**

1. Conbraco Industries
2. Nibco, Inc.
3. Milwaukee Valve Company

### **B. Up To and Including 3 Inches:**

1. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder ends.

### **C. 3 Inches and Larger:**

1. MSS SP-70, Class 125, iron body, bronze trim, outside screw and yoke, handwheel, solid wedge disc, flanged ends. Provide chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

## **2.09 GLOBE VALVES**

### **A. Manufacturers:**

1. Conbraco Industries
2. Nibco, Inc.

3. Milwaukee Valve Company

B. Up To and Including 3 Inches:

1. MSS SP-80, Class 125, bronze body, bronze trim, handwheel, bronze disc, solder or threaded ends.

C. 3 Inches and Larger:

1. MSS SP-85, Class 125, iron body, bronze trim, handwheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Provide chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

## **2.10 BALL VALVES**

A. Manufacturers:

1. Conbraco Industries
2. Nibco, Inc.
3. Milwaukee Valve Company

- B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze, two piece body, chrome plated brass ball, regular port, Teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder ends.

## **2.11 PLUG VALVES**

A. Manufacturers:

1. Conbraco Industries
2. Nibco, Inc.
3. Milwaukee Valve Company

- B. Construction 2-1/2 Inches and Larger: MSS SP-78, 175 psi CWP, cast iron body and plug, pressure lubricated, Teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

## **2.12 BUTTERFLY VALVES**

A. Manufacturers:

1. Hammond Valve
  2. Crane Valve
  3. Milwaukee Valve Company
  4. Keystone Valve
- B. Construction 1-1/2 Inches and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, elastomer coated ductile iron disc, resilient replaceable EPDM seat, lug or grooved ends, extended neck, infinite position lever handle with memory stop.
- C. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

## **2.13 FLOW CONTROLS**

- A. Manufacturers:
1. ITT Bell & Gossett
  2. Griswold Controls
  3. Taco, Inc.
- B. Construction: Class 125, Brass or bronze body with union on inlet, temperature and pressure test plug on inlet and outlet.
- C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

## **2.14 SWING CHECK VALVES**

- A. Manufacturers:
1. Hammond Valve
  2. Nibco, Inc.
  3. Milwaukee Valve Company

B. Up to 2 Inches:

1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder ends.

C. Over 2 Inches:

1. MSS SP-71, Class 125, iron body, bronze swing disc, renewable disc seal and seat, flanged ends.

## **2.15 SPRING LOADED CHECK VALVES**

A. Manufacturers:

1. Hammond Valve
2. Crane Valve
3. Milwaukee Valve Company

- B. Class 125, iron body, bronze trim, stainless steel springs, bronze disc, EPDM seals, wafer style ends.

## **2.16 WATER PRESSURE REDUCING VALVES**

A. Manufacturers:

1. Amtrol Inc
2. Cla-Val Co.
3. Watts Regulator Company

B. Up to 2 Inches:

1. MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded double union ends.

C. Over 2 Inches:

1. MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

## **2.17 RELIEF VALVES**

### **A. Pressure Relief:**

1. Manufacturers:
  - a. Cla-Val Co.
  - b. Henry Technologies
  - c. Watts Regulator Company
2. AGA Z21.22 certified, bronze body, Teflon seat, steel stem and springs, automatic, direct pressure actuated.

### **B. Temperature and Pressure Relief:**

1. Manufacturers:
  - a. Cla-Val Co.
  - b. Henry Technologies
  - c. Watts Regulator Company
2. AGA Z21.22 certified, bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labeled.

## **2.18 STRAINERS**

### **A. Manufacturers:**

1. Armstrong International, Inc.
2. Green Country Filtration
3. WEAMCO

### **B. Size 2 inch and Under:**

1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
- C. Size 1-1/2 inch to 4 inch:
  1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.
- D. Size 5 inch and Larger:
  1. Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that excavations are to required grade, dry, and not over-excavated.

#### **3.02 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

#### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
- I. Establish elevations of buried piping outside the building to ensure not less than 4 feet of cover.
- J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
- K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- L. Provide support for utility meters in accordance with requirements of utility companies.
- M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- N. Install bell and spigot pipe with bell end upstream.
- O. Install valves with stems upright or horizontal, not inverted.
- P. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- Q. Install water piping to ASME B31.9.
- R. PVC Pipe: Make solvent-welded joints in accordance with ASTM D 2855.
- S. Sleeve pipes passing through partitions, walls and floors.
- T. Inserts:
  - 1. Provide inserts for placement in concrete formwork.
  - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
  - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
  - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

- U. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9, ASTM F 708, and MSS SP-89.
  - 2. Support horizontal piping as scheduled.
  - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 4. Place hangers within 12 inches of each horizontal elbow.
  - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
  - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  - 8. Provide copper plated hangers and supports for copper piping.
  - 9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
  - 10. Provide hangers adjacent to motor driven equipment with vibration isolation.
  - 11. Support cast iron drainage piping at every joint.
- V. Weld all high pressure gas piping (1 psig and above), both natural gas and propane, regardless of pipe size.
- W. Test all new piping. Correct leaks and retest.

### **3.04 APPLICATION**

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.



- D. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Install globe or ball valves for throttling, bypass, or manual flow control services.
- F. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.
- G. Provide spring loaded check valves on discharge of water pumps.
- H. Provide plug valves in [natural] or [propane] gas systems for shut-off service.
- I. Provide flow controls in water recirculating systems where indicated.

### **3.05 ERECTION TOLERANCES**

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot or as indicated on drawing notes.
- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

### **3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM**

- A. Disinfect water distribution system in accordance with Section 33 1300.
- B. Prior to starting work, verify system is complete, flushed and clean.
- C. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 5 percent of outlets and from water entry, and not less than a total of 5 outlets, and analyze in accordance with AWWA C651.

### 3.07 SCHEDULES

#### A. Pipe Hanger Spacing:

##### 1. Metal Piping:

- a. Pipe size: 1/2 inches to 1 inch:
  - 1) Maximum hanger spacing: 6.0 ft.
  - 2) Hanger rod diameter: 3/8 inches.
- b. Pipe size: 1-1/4 inches to 2 inches:
  - 1) Maximum hanger spacing: 9 ft.
  - 2) Hanger rod diameter: 3/8 inch.
- c. Pipe size: 2-1/2 inches to 5 inches:
  - 1) Maximum hanger spacing: 10 ft.
  - 2) Hanger rod diameter: 1/2 inch.
- d. Pipe size: 6 inches and larger:
  - 1) Maximum hanger spacing: 10 ft.
  - 2) Hanger rod diameter: 5/8 inch.

##### 2. Plastic Piping:

- a. All Sizes:
  - 1) Maximum hanger spacing: 6 ft.
  - 2) Hanger rod diameter: 3/8 inch.

**END OF SECTION 221005**

## **SECTION 221006 - PLUMBING PIPING SPECIALTIES**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Floor drains.
- B. Cleanouts.
- C. Backflow preventers.
- D. Water hammer arrestors.
- E. Interceptors.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ASME A112.6.3 - Floor and Trench Drains; The American Society of Mechanical Engineers.
- B. ASME A112.6.4 - Roof, Deck, and Balcony Drains; The American Society of Mechanical Engineers.
- C. ASSE 1011 - Hose Connection Vacuum Breakers; American Society of Sanitary Engineering; (ANSI/ASSE 1011).
- D. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent; American Society of Sanitary Engineering; (ANSI/ASSE 1012).
- E. ASSE 1013 - Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers; American Society of Sanitary Engineering.
- F. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering; (ANSI/ASSE 1019).
- G. ASTM C 478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
- H. ASTM C 478M - Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).

- I. PDI-WH 201 - Water Hammer Arresters; Plumbing and Drainage Institute.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- C. Certificates: Certify that grease or oil interceptors meet or exceed specified requirements.
- D. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- E. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.
- F. Operation Data: Indicate frequency of treatment required for interceptors.
- G. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

#### **1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Accept specialties on site in original factory packaging. Inspect for damage.

#### **1.07 EXTRA MATERIALS**

- A. Supply for Owner's use in maintenance of project:
  - 1. Two loose keys for outside hose bibbs.
  - 2. Two hose end vacuum breakers for hose bibbs.
  - 3. Two service kits for mixing valves.

### **PART 2 - PRODUCTS**

#### **2.01 DRAINS**

- A. Manufacturers:

1. Josam Company
2. Jay R. Smith Manufacturing Company
3. Zurn Industries, Inc

B. Floor Drain (HD-1):

1. ASME A112.6.7/CSA B79.7: DUCO coated cast iron body with an adapter for acid waste system.

## **2.02 CLEANOUTS**

A. Manufacturers:

1. Orion by Watts Regulator Company.
2. ChemDrain by Charlotte Pipe.
3. Enfield Electrofusion by IPEX Inc.

B. Cleanouts at Interior Finished Floor Areas:

1. Fiberglass reinforced polypropylene body supplied with countersunk plug and adjustable stainless steel top assembly with round stainless steel cover.

C. Cleanouts at Interior Finished Wall Areas:

1. Fiberglass reinforced polypropylene bod supplied with countersunk plug and adjustable stainless steel top assembly with round stainless steel cover and round stainless steel access cover plate secured with machine screw into cleanout plug.

D. Cleanouts at Interior Unfinished Accessible Areas:

1. Threaded fiberglass reinforced polypropylene type.

## **2.03 SUPPLY BOXES AND VALVES**

A. Box Manufacturers:

1. IPS Corporation/Water-Tite
2. Oatey

B. Valve Manufacturers:

1. IPS Corporation/Water-Tite
2. Zurn Industries, Inc.
3. Jomar Valve.

- C. Description: Plastic preformed rough-in box with brass long shank valves with wheel handles, socket for 2 inch waste, slip in finishing cover.

## **2.04 BACKFLOW PREVENTERS**

A. Manufacturers:

1. Watts Regulator Co.
2. Zurn Industries, Inc.
3. Ames Fire and Waterworks

B. Reduced Pressure Backflow Preventers:

1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two full port ball valves, strainer, and four test cocks.

## **2.05 WATER HAMMER ARRESTORS**

A. Manufacturers:

1. Jay R. Smith Manufacturing Company
2. Watts Regulator Company
3. Zurn Industries, Inc.
4. Precision Plumbing Products
5. Josam
6. Sioux Chief Mfg.

B. Water Hammer Arrestors:

1. Stainless steel or copper construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

## **2.06 MIXING VALVES**

A. Thermostatic Mixing Valves:

1. Manufacturers:
  - a. MGI Controls
  - b. Watts Regulator Co.
  - c. Honeywell Water Controls (Sparco)
  - d. Zurn Industries Inc.
2. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment, complies to ASSE 1070 standard.
3. Capacity: As scheduled on the drawings.
4. Accessories:
  - a. Shutoff ball valves.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Install floor cleanouts at elevation to accommodate finished floor.
- D. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.

- E. Pipe relief from backflow preventer to nearest drain.
- F. Install water hammer arrestors as indicated on riser diagrams, drawings, complete with accessible isolation valve on hot and cold water supply piping to lavatories sinks, washing machine outlets, and flush valves.
- G. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch minimum, and minimum 18 inches long.

**END OF SECTION 221006**



## **SECTION 223000 - PLUMBING EQUIPMENT**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Reverse Osmosis Water Systems.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ANSI Z21.10.1 - Gas Water Heaters - Volume I - Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less.
- B. ANSI Z21.10.3 - Gas Water Heaters - Volume III - Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous Water Heaters.
- C. ASME (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers.
- D. NFPA 31 - Standard for the Installation of Oil Burning Equipment.
- E. NFPA 54 - National Fuel Gas Code.
- F. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Underwriters Laboratories Inc.
- G. UL 1453 - Standard for Electric Booster and Commercial Storage Tank Water Heaters; Underwriters Laboratories Inc.

#### **1.04 SUBMITTALS**

- A. Product Data:
  - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
  - 2. Indicate pump type, capacity, power requirements.

3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
  4. Provide electrical characteristics and connection requirements.
- B. Shop Drawings:
1. Indicate heat exchanger dimensions, size of tappings, and performance data.
  2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.
- C. Manufacturer's Instructions: Indicate installation and maintenance procedures.
- D. Project Record Documents: Record actual locations of components and equipment.
- E. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.
- C. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

#### **1.06 CERTIFICATIONS**

- A. Reverse Osmosis Water Filtration: Meeting or exceeding ASTM D1193-06, ASTM D4194-03, ASTM D4516-00, ISO 3696, CLSI GP40 Ed5 laboratory water quality standards.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

## **1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

## **1.08 WARRANTY**

- A. Provide five year manufacturer warranty reverse osmosis water filtration systems.

## **1.09 MAINTENANCE PRODUCTS**

- A. Supply two additional sets of all required filter cartridges and instructions for reordering/subscribing for restocking service.

## **PART 2 - PRODUCTS**

### **2.01 REVSERSE OSMOSIS WATER FILTRATION STATIONS**

- A. Manufacturer: Millipore Sigma.
- B. Performance:
  - 1. Flow and Capacity: As scheduled on the drawings.
  - 2. Electrical Characteristics: As scheduled on the drawings.
- C. Storage Tank: Polyethylene blow molded with optional UV sanitation module.
- D. Filtration Cartridges: Integral 0.22 micron filtration bank providing Ultra Pure Water Type 1.
- E. Controls: Integral digital control panel with touch screen display providing systems status, components configuration and filter usage status.
- F. Pre-Filtration Accessories: System is to be provided with strainer, backflow preventer, pressure reducing valve, shutoff valve and pre-filtration 0.5 micron filtration cartridge equal to Watts PWDWHCUCI carbon block filter.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and electrical work to achieve operating system.

C. Reverse Osmosis Water Purification Station:

1. Provide adequate support for all pre-filtration accessories. Use only manufacturer approved stainless steel or polypropylene flexible hoses to connect pre-filtration equipment with reverse osmosis station.
2. Coordinate all pre-filtration accessories with manufacturer of reverse osmosis system and provide any additional pre-filtration required to achieve necessary feed water quality.
3. Follow all manufacturer's instructions when installing the system,
4. Provide test reports for all feed water exiting pre-filtration station and Ultra-Pure Water Type 1 produced by reverse osmosis system. Submit all reports to the client and engineer of record prior to project's turn over.
5. Provide written instructions to the client for operation, testing and maintenance of both Reverse Osmosis station and all pre-filtration accessories.
6. Coordinate all required electrical connections with Electrical Contractor and provide any required means of disconnect.
7. Coordinate exact location of tank and turret with architectural casework prior to any installation.

**END OF SECTION 223000**

## **SECTION 224000 - PLUMBING FIXTURES**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Work includes removing existing and providing new plumbing fixtures and related work.
- B. Fixtures include:
  - 1. Sinks.
  - 2. Eye and face wash fountains.
  - 3. Emergency showers.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ANSI Z124.1 - American National Standard for Plastic Bathtub Units.
- B. ANSI Z124.2 - American National Standard for Plastic Shower Units.
- C. ANSI Z124.1.2 - American National Standard for Plastic Bathtub and Shower Units.
- D. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment.
- E. ARI 1010 - Self-Contained, Mechanically-Refrigerated Drinking-Water Coolers; Air-Conditioning and Refrigeration Institute.
- F. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers.
- G. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers.
- H. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures; The American Society of Mechanical Engineers.
- I. ASME A112.19.2 - Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals; The American Society of Mechanical Engineers.

- J. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); The American Society of Mechanical Engineers.
- K. ASME A112.19.4M - Porcelain Enameled Formed Steel Plumbing Fixtures; The American Society of Mechanical Engineers.
- L. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks and Urinals; The American Society of Mechanical Engineers.
- M. ASME A112.19.14 - Six Liter Water Closets Equipped with Dual Flushing Device.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- B. Samples: Submit two sets of color chips for each standard color.
- C. Manufacturer's Instructions: Indicate installation methods and procedures.
- D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- E. Waterless Urinals: Submit recommended frequency of maintenance and parts replacement, methods of cleaning, sources of replacement supplies and parts.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

#### **1.06 REGULATORY REQUIREMENTS**

- A. Conform to the requirements of National Standard Plumbing Code 2021, New jersey Edition with NJAC 5:23-3.15 amendments issued by the state of New Jersey.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to the authority having jurisdiction, as suitable for the purpose specified and indicated.

### **1.07 MOCK-UP**

- A. Provide mock-up of typical laboratory workstation.
- B. Mock-up may remain as part of the Work.

### **1.08 DELIVERY, STORAGE, AND PROTECTION**

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

### **1.09 WARRANTY**

- A. Provide five year manufacturer warranty for electric water cooler.

### **1.10 EXTRA MATERIALS**

- A. Supply two sets of faucet washers, flush valve service kits, shower heads and toilet seats.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

- A. Plumbing fixtures shall be provided as indicated on the drawings, and shall be provided complete with all fittings, trim, bolts, caps, plates and hangers suitable for individual mounting requirements. Fixtures shall be of the water-saver type, and shall comply with local plumbing code.
- B. Fixture supplies shall be equipped with stop valves.
- C. Finished installation of plumbing fixtures shall present a neat, finished and uniform appearance. All fixtures, trimmings, fittings and accessories shall be finished with parts true to form, properly fitted, and of materials free from defects.
- D. Hot water shall be supplied and controlled at the left, and cold water at the right where both hot and cold water are supplied to fixtures through separate or combination fittings.
- E. Protection of fixtures, materials and equipment shall be exercised at all times during delivery, storage and handling. Fixtures and equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury.

## **2.02 LABORATORY SINKS**

### **A. Manufacturers:**

1. Orion by Watts Regulator Co.
2. Hanson lab Solutions.
3. Fisher Scientific.
4. Durcon by Wilsonart Company.
5. Chicago Faucets Inc.
6. Marquest Scientific - Fluid Handling Products.

### **B. Single Compartment Bowl:**

1. NSF/ANSI 51 certified and meeting SEFA Chemical Resistant/Moisture/Heat and Flammability Standards, size as scheduled on the drawings.
  - a. Single piece mold, minimum 1/2 inch thick epoxy resin, self-rimming.
  - b. Single piece mold, minimum 1/2 inch thick polypropylene, self-rimming.
2. Drain: Polyethylene 3/8 inch locknut with acid waste compliant tailpiece.

### **C. Trim: ASME A112.18.1/CSA B125.1; chrome plated brass supply with high rise 8 inch swing rigid neck spout, laboratory nozzle with 10 serrations for laboratory hose, slow compression operating cartridges, 2-1/2 inch cross handles with index buttons.**

### **D. Accessories: P-trap with cleanout plug and arm with escutcheon, wheel handle stop, stainless steel hose flexible supplies.**

## **2.03 EMERGENCY EYE AND FACE WASH**

### **A. Manufacturers:**

1. Guardian Equipment.
2. ULINE Company.
3. Speakman Company



- B. Meet or exceed ANSI Z358.1 - 2014; minimum 2 year warranty; Deck mounted swivel eye wash with 1/2 inch IPS plug-type valve with PTFE coated O-ring seals. Supplied with in-line strainer to protect valve and spray heads from debris in water line. Unit shall have two polypropylene spray heads with integral "flip-top" dust covers, filters and 1.6 GPM flow control orifices mounted on a chrome plated brass eyewash assembly. Activate valve by rotating 90° from stored position. Unit shall include ANSI compliant sign.

## **2.04 EMERGENCY SHOWERS**

- A. Manufacturers:
  - 1. Guardian Equipment.
  - 2. ULINE Company.
  - 3. Speakman Company.
- B. Meet or Exceed ANSI Z358.1 - 2014; ADA Compliant; minimum 2 year warranty; Barrier Free, recessed, wall mounted emergency shower with ceiling mounted, stainless steel shower head, internal 20 GPM flow control, nipple, escutcheon, concealed 1" IPS brass ball valve (locked in open position with handle removed), water hammer arrestor, 1" IPS brass unions, stainless steel "panic bar" with vinyl grip, and 16 gauge type 304 stainless steel cabinet with #4 brushed satin finish and access panel. Unit shall include ANSI compliant sign.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

### **3.02 PREPARATION**

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

### **3.03 INSTALLATION**

- A. Install each fixture with trap, easily removable for servicing and cleaning.

- B. Provide flexible stainless steel supplies to fixtures with loose key or screwdriver stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with all required supports or wall carriers and bolts.
- E. Seal fixtures to wall or cabinet and floor surfaces with sealant, color to match fixture.

### **3.04 INTERFACE WITH WORK OF OTHER SECTIONS**

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

### **3.05 ADJUSTING**

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

### **3.06 CLEANING AND PROTECTION**

- A. Clean plumbing fixtures and equipment.
- B. Do not permit use of fixtures.

### **3.07 SCHEDULES**

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
  - 1. Emergency Eye and Face Wash:
    - a. Standard: 38 inches to receptor rim.
  - 2. Emergency Shower:
    - a. Standard: 84 inches to bottom of head.

**END OF SECTION 224000**

## **SECTION 226005 - MEDICAL AIR, GAS, AND VACUUM SYSTEMS**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Work includes removing existing, providing new, and modifying existing medical gas systems.
- B. Systems include:
  - 1. Medical compressed air system.
  - 2. Medical vacuum system.
  - 3. Carbon dioxide system.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 ALLOWANCES**

- A. Allowance includes purchase and delivery of bottled gases. Installation is not included in the allowance but is specified in this section and is part of the Contract Sum/Price.
- B. Allowance includes cost of testing and certifying systems in accordance with cross connection tests.

#### **1.04 REFERENCES**

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; (ANSI B16.18).
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.
- C. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers.
- D. ASME (BPV) - Boiler and Pressure Vessel Code; The American Society of Mechanical Engineers.

- E. ASTM A 269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- F. ASTM A 403/A 403M - Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings.
- G. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- H. ASTM B 32 - Standard Specification for Solder Metal.
- I. ASTM B 88 - Standard Specification for Seamless Copper Water Tube.
- J. ASTM B 88M - Standard Specification for Seamless Copper Water Tube (Metric).
- K. ASTM B 819 - Standard Specification for Seamless Copper Tube for Medical Gas Systems.
- L. ASTM D 1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- M. ASTM D 2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- N. ASTM D 2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
- O. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society.
- P. CGA G-7 - Compressed Air for Human Respiration; Compressed Gas Association.
- Q. CGA V-5 - Diameter-Index Safety System (Noninterchangeable Low Pressure Connections for Medical Gas Applications); Compressed Gas Association.
- R. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- S. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- T. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.

- U. MSS SP-88 - Diaphragm Type Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- V. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
- W. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association.
- X. NFPA 50 - Standard for Bulk Oxygen Systems at Consumer Sites; National Fire Protection Association.
- Y. NFPA 55 - Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks; National Fire Protection Association.
- Z. NFPA 99 - Standard for Health Care Facilities; National Fire Protection Association.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide manufacturers literature and illustrations for all components indicating size, dimensions and configuration.
- B. Shop Drawings: Indicate general assembly of components, mounting and installation details, and general layout of control and alarm panels. Submit detailed medical wall assembly drawings.
- C. Independent Testing Agency Reports: Indicate systems are complete, zone valves installed, alarm systems functional, and pressure and cross connections tests performed. Document tests.
- D. Certificates: Certify that Products meet or exceed specified requirements.
- E. Manufacturer's Instructions: Indicate installation requirements for equipment and systems.
- F. Manufacturer's Field Reports: Indicate systems are complete, zone valves installed, and alarm systems functional.
- G. Project Record Documents: Record actual locations of piping, valving, and outlets.
- H. Operation Data: Include installation instructions, assembly views, lubrication instructions, and assembly views.
- I. Maintenance Data: Include maintenance and inspection data, replacement part numbers and availability, and service depot location and telephone.

- J. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

#### **1.06 QUALITY ASSURANCE**

- A. Perform Work in accordance with NFPA 99.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience.
- D. Testing Laboratory: Company specializing in performing testing of the type specified in this section, with minimum three years of documented experience.
- E. Conform to applicable code for medical gas systems. NFPA 99 Level I systems shall apply in hospitals, Level II systems shall apply in nursing homes and medical office buildings, and Level III shall apply in dental offices and laboratories.
- F. Provide certificate of compliance from authority having jurisdiction, indicating approval of systems.
- G. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

#### **1.07 MOCK-UP**

- A. Provide mock-up of gas turrets in typical laboratory work station.
- B. Locate as directed by architectural team and owner representative.
- C. Mock-up may remain as part of the Work.

#### **1.08 DELIVERY, STORAGE, AND PROTECTION**

- A. Accept material on site in factory containers and packing. Inspect for damage.
- B. Protect from damage and contamination by maintaining factory packaging and caps in place until installation.

## **1.09 COORDINATION WITH WORK BY OTHERS**

### **A. Electrical:**

1. In Level III facilities, electrical power shall be from normal power source, unless noted otherwise.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Allied Healthcare Products, Inc.
- B. Amico Corporation
- C. BeaconMedaes
- D. Ohio Medical Corporation
- E. Chicago Faucets
- F. Fisher Scientific
- G. Zurn Industries Inc.

### **2.02 PIPE AND FITTINGS**

- A. Factory Preparation: Wash inside of copper pipe and copper fitting with hot solution of sodium carbonate or trisodium phosphate mixed 1 lb. to 3 gal of water; rinse with water, and blow dry with oil-free dry nitrogen or compressed air.
- B. Compressed Air and Carbon Dioxide Aboveground:
  1. Copper Tube: ASTM B 819, Type K, H58 (drawn general purpose) temper.
  2. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper.
  3. Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.
- C. Vacuum Aboveground:
  1. Copper Tube: ASTM B 819, Type K, H58 (drawn, general purpose) temper.

2. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper.

3. Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 silver braze.

## **2.03 VALVES**

A. Factory Preparation for Oxygen Service: Disassemble, clean, degrease, seal, and pack for shipping.

B. Ball Valves:

1. Requirements: Comply with MSS SP-110; bronze body, three piece, double-seal ball valves with replaceable neoprene or Teflon seat and stem seals, for minimum 600 psi cold working pressure, flange or union mounting, labeled for intended service.

C. Diaphragm Valves (Carbon Dioxide):

1. MSS SP-88, brass-bodied, packless, diaphragm type with regrinding or renewable seats and disks, for minimum 300 psi working pressure.

D. Pressure Regulation Valves (Medical Air):

1. MSS SP-88, brass-bodied, packless, diaphragm type with regrinding or renewable seats and disks for minimum 300 psi working pressure.

E. Gate Valves (Vacuum and Medical Air):

1. MSS SP-80; Class 150 bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder or threaded ends.

## **2.04 PIPING ACCESSORIES**

A. Hangers and Supports: MSS SP-58 with types as required by MSS SP-69.

B. Pressure Gages:

1. ASME B40.100, white dials and black lettering with restrictor.

C. Vacuum Bottle Brackets: Stainless steel, chrome-plated metal, or aluminum with finish matching adjacent outlet.

D. Flexible Connectors: Corrugated flexible, single ply, seamless or seam-welded tubing of stainless steel or bronze or reinforced Teflon bellows or hose.



E. Valve Cabinets:

1. Extruded aluminum, flush-mounted and rigidly assembled to accommodate valves and fittings, punched or drilled sides to receive tubing, anchors to secure to wall construction.
2. Cover Plates: Extruded aluminum, with replaceable plastic windows with pull ring to remove window.
3. Cabinet Labels: Labeled and color coded for intended service and area served.
4. Valves: Pre-assemble and mount chrome plated valves and tubing extensions.
5. Gages: Provide where indicated and in operating rooms and intensive care areas downstream of isolating valves.

F. Piping Identification: Pressure sensitive adhesive tape and decals.

**2.05 OUTLETS, GAS TURRETS AND DISTRIBUTION MANIFOLDS**

A. Outlet Units:

1. CGA V-5, Diameter-Index Safety System (DISS) or quick-disconnect type, as indicated by laboratory equipment vendors, non-interchangeable connectors, automatic valves, secondary check valves (except vacuum and evacuation outlets), and capped 3/8 inch tubing stubs for supply connections, color coded and labeled for intended service.

B. Faceplates:

1. Flush Outlets: Mount in galvanized steel boxes with stainless steel or chrome plated faceplate with Lexan cover, color coded with embossed labeling.
2. Surface Outlets: Surface mount with color coded plastic cover and stainless steel or chrome plated faceplate with Lexan cover, color coded with embossed labeling.

C. Gas Turrets.

1. Chrome plated with Satin Antimicrobial (SAM) finish. Serrated, full-flow laboratory nozzle. Includes shank assembly with male thread. All threaded connections factory assembled. Anti-rotational deck pin in faucet body prevents turning. Certified for Gas Service per ANSI Z21.15b-2006/CSA 9.1b-2006. Mounting hardware included.

D. Compressed air and Vacuum service manifold.

1. Custom metal and plastic manifolds are to be equipped with a pair of vacuum and compressed air turrets. All turrets are to be chrome plated with Satin Antimicrobial (SAM) finish, Serrated, full-flow laboratory nozzles equipped with back flow prevention. Assembly is to be certified for Gas Service per ANSI Z21.15b-2006/CSA 9.1b-2006. Coordinate all orders with architectural team prior to any equipment purchase.

**2.06 ALARM SYSTEM**

- A. Modular design, digital zone alarm panels, located as indicated on the drawings. Provide pressure/vacuum switches in piping. Label all panels with engraved phenolic nameplates.
- B. High-Low Pressure Alarm Panels: Closed circuit, self-monitoring type, to monitor vacuum, compressed air, and carbon dioxide pressures.
  1. Green light for systems normal.
  2. High or low pressure warning:
    - a. Green light extinguishes.
    - b. Audible warning device sounds.
    - c. Red light energizes.
  3. Gage indicates pressure or vacuum.
  4. Switch silences warning device.
  5. Test switch to test light bulbs and audible warning device.
  6. Provide system with internal switches, gages, control unit, and transformer.
- C. Multi-Signal Alarm Panel:
  1. Closed circuit, self-monitoring type, to monitor oxygen, vacuum, compressed air, nitrous oxide, carbon dioxide, and nitrogen piping systems pressure or liquid level.
  2. Green light for systems normal.
  3. For abnormal condition:
    - a. Green light extinguishes.

- b. Audible warning device sounds.
  - c. Red light energizes.
- 4. Switch silences warning device.
- 5. Test switch to test light bulbs and audible warning device.
- 6. Design system such that one, two or more monitors may be connected to a single pressure switch.
- 7. Monitor following abnormal conditions:
  - a. Air line pressure high.
  - b. Air line pressure low.
  - c. Air lag compressor on.
  - d. Vacuum line pressure above normal.
  - e. Vacuum line pressure below normal.
  - f. Vacuum lag pump on
  - g. CO level high at air compressors.
  - h. Carbon dioxide reserve supply in use.
  - i. Carbon dioxide pressure high.
  - j. Carbon dioxide pressure low.
- 8. High-low pressure switch: Dual circuit with two single pole, double throw, snap action switches, tested at 180 psi with adjustable range of 4 psi, preset at 40 psi and 60 psi.
- 9. Vacuum switch: Preset at 15 inches Hg and 27 inches Hg.
- 10. All alarm panel signals not originating from new service zone, such as those that monitor central equipment and gas reserves, are to be tied into the building's central alarm system as no new central generation or storage equipment is provided as part of this project.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with NFPA 99.
- B. Pre-Installation Cleaning: Disassemble positive pressure gas systems pipe, fittings, valves, and components, except those supplied cleaned and prepared for intended service, and thoroughly wash in hot solution of sodium carbonate or trisodium phosphate mixed 1 lb. to 3 gal of water. After washing, rinse with water, dry and cap until installation.
- C. Braze joints in pipe and tubing. Do not use flux in joining of pipe and fittings. During brazing of pipe connections, purge interior of pipe continuously with nitrogen.
- D. Effect changes in size with reducing fittings. Make changes in direction of required turns or offsets with fittings or tubing shaped by bending tools. Make bends free of flattening, buckling or thinning of tube wall.
- E. Cut pipe and tubing accurately and install without springing or forcing.
- F. Grade piping down in direction of flow.
- G. Provide pipe sleeves where pipes and tubing pass through walls, floors, roofs, and partitions. Finish flush at both ends. Extend 2 inches above finished floors. Pack space between pipe or tubing and sleeve, and caulk.
- H. Identify piping with tape and decals. Provide piping identification code and schematic for installation. Install labeling on pipe at intervals of not more than 20 feet and at least once in each room and each story traversed by pipeline.
- I. Support gas piping with pipe hooks or hangers suitable for size of pipe, spaced:
  - 1. 1/2 inch pipe or tubing: 72 inches
  - 2. 3/4 inch or 1 inch pipe or tubing: 96 inches
  - 3. 1-1/4 inches or larger (horizontal): 120 inches
  - 4. 1-1/4 inches or larger (vertical): Every floor level
- J. Except where indicated or in flush wall mounted cabinets, install manual shut off valves with stem vertical and accessible for operation and maintenance.

- K. Install strainers on inlet side of pressure reducing valves. Provide main gas valves (pressure reducing or flow control) with by-passes and isolation valves to permit maintenance without interruption of gas.
- L. Provide a valved by-pass around receivers.

### **3.02 PIPING SYSTEMS CLEANING AND PRESSURE TESTING**

- A. After erection of pipe and tubing but prior to installation of service outlet valves, blow systems clear of free moisture and foreign matter with nitrogen gas.
- B. Install service outlet valves, subject system to test pressure of 150 psi with nitrogen or dry compressed air. Check with soapy water. Provide 24-hour standing pressure test.

### **3.03 FIELD QUALITY CONTROL**

- A. Independent testing agency to certify system is complete, zone valves installed, alarm systems functional, and tests performed. Document tests and submit.
- B. Reduce pressure in piping systems other than system under investigation to atmospheric.
- C. Test system with dry compressed air or dry nitrogen with test pressure in piping system at 50 psi.
- D. Check each station outlet of every piping system to determine test gas is dispensed only from outlet of system under investigation. Measure pressure with gage attached to specific adapter. Do not use universal adapters.
- E. Disconnect test gas and connect proper gas to each system. Purge entire system to remove test gas. Check with analyzer suitable for gas installed.

**END OF SECTION 226005**

## **SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Single phase electric motors.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; American Bearing Manufacturers Association, Inc.
- B. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; Institute of Electrical and Electronic Engineers.
- C. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association.
- D. NFPA 70 - National Electrical Code; National Fire Protection Association.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- B. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
- C. Operation Data: Include instructions for safe operating procedures.
- D. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacture of electric motors for commercial use, and their accessories, with minimum three years documented product development, testing, and manufacturing experience.

- B. Conform to [Philadelphia Electrical Code], NFPA 70, and State Energy Code.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc. as suitable for the purpose specified and indicated.

## **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Reliance Electric/Rockwell Automation
- B. Baldor Electric Co.
- C. U.S. Motor

### **2.02 GENERAL CONSTRUCTION AND REQUIREMENTS**

- A. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- B. Wiring Terminations:
  - 1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
  - 2. For fractional horsepower motors where connection is made directly, provide conduit connection in end frame.
- C. Except as otherwise specified, motors shall be dripproof. Motors for belt drives shall have sliding bases.
- D. All motors associated with variable frequency drives (VFD) shall be inverter duty type, and shall comply with NEMA MG-1, Part 3.1. Insulation shall be Class F or better. Temperature rise at full load with sine wave power shall not exceed Class B temperature limit. Thermal cut-out switch shall be "Klixon" type. Motor service factor shall be 1.0 when operating from variable frequency drive. Nameplate shall have markings as "inverter duty motor".

## **2.03 APPLICATIONS**

- A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not conform to these specifications.
- B. Single phase motors for shaft mounted fans, oil burners and centrifugal pumps: Split phase type.
- C. Single phase motors for fans, blowers and pumps: Capacitor start, capacitor run type.

## **2.04 SINGLE PHASE POWER - SPLIT PHASE MOTORS**

- A. Starting Torque: Less than 150 percent of full load torque.
- B. Starting Current: Up to seven times full load current.
- C. Breakdown Torque: Approximately 200 percent of full load torque.
- D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.
- E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

## **2.05 SINGLE PHASE POWER - CAPACITOR START MOTORS**

- A. Starting Torque: Three times full load torque.
- B. Starting Current: Less than five times full load current.
- C. Pull-up Torque: Up to 350 percent of full load torque.
- D. Breakdown Torque: Approximately 250 percent of full load torque.
- E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.
- G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.



## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

### **3.02 SCHEDULE**

- A. NEMA Open Motor Service Factors.

- 1. 1/6-1/3 hp:
  - a. 3600 rpm: 1.35.
  - b. 1800 rpm: 1.35.
  - c. 1200 rpm: 1.35.
  - d. 900 rpm: 1.35.
- 2. 1/2 hp:
  - a. 3600 rpm: 1.25.
  - b. 1800 rpm: 1.25.
  - c. 1200 rpm: 1.25.
  - d. 900 rpm: 1.15.
- 3. 3/4 hp:
  - a. 3600 rpm: 1.25.
  - b. 1800 rpm: 1.25.
  - c. 1200 rpm: 1.15.
  - d. 900 rpm: 1.15.

4. 1 hp:
  - a. 3600 rpm: 1.25.
  - b. 1800 rpm: 1.15.
  - c. 1200 rpm: 1.15.
  - d. 900 rpm: 1.15.
5. 1.5-150 hp:
  - a. 3600 rpm: 1.15.
  - b. 1800 rpm: 1.15.
  - c. 1200 rpm: 1.15.
  - d. 900 rpm: 1.15.

**END OF SECTION 230513**

## **SECTION 230519 - METERS AND GAGES FOR HVAC PIPING**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Flow meters.
- B. Pressure gages and pressure gage taps.
- C. Thermometers and thermometer wells.
- D. Static pressure gages.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers.
- B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi; The American Society of Mechanical Engineers.
- C. ASTM E 1 - Standard Specification for ASTM Thermometers.
- D. ASTM E 77 - Standard Test Method for Inspection and Verification of Thermometers.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.
- B. Project Record Documents: Record actual locations of components and instrumentation.

#### **1.05 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

## **PART 2 - PRODUCTS**

### **2.01 LIQUID FLOW METERS**

A. Manufacturers:

1. Dwyer Instruments, Inc.
2. Venture Measurement Company
3. McCrometer
4. Annubar
5. Barco
6. ITT Bell & Gossett

B. ASME MFC-3M Calibrated venturi orifice plate and flanges, [or machined venturi flow meter], with valved taps, chart for conversion of differential pressure readings to flow rate, with pressure gage in case.

C. Annular element flow stations with meter set.

1. Measuring Station: Type 316 stainless steel pitot type flow element inserted through welded threaded couplet, or installed in threaded nipple pipe section with safety shut-off valves and quick coupling connections, and permanent metal tag indicating design flow rate, reading for design flow rate, metered fluid, line size, station or location number.
  - a. Pressure rating: 275 psi.
  - b. Maximum temperature: 400 degrees F.
  - c. Accuracy: Plus 0.55 percent to minus 2.30 percent.

### **2.02 PRESSURE GAGES**

A. Manufacturers:

1. Dwyer Instruments, Inc.
2. Mueller Instrument Co., Inc.

3. Omega Engineering, Inc.
  4. H.O. Trerice Co.
  5. Ametek, Inc., U.S. Gauge Division
  6. Weiss Instruments, Inc.
- B. Gage: ASME B40.100 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
1. Case: Cast aluminum with phosphor bronze bourdon tube.
  2. Size: 4-1/2 inch diameter.
  3. Mid-Scale Accuracy: One percent.
  4. Scale: Psi.

## **2.03 PRESSURE GAGE TAPPINGS**

- A. Gage Cock: Tee or lever handle, brass for maximum 150 psi.
- B. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.
- C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.
- D. Syphon: Steel, Schedule 40, Brass, Iron, Stainless Steel or Bronze 1/4 inch angle or straight pattern.

## **2.04 STEM TYPE THERMOMETERS**

- A. Manufacturers:
  1. Dwyer Instruments, Inc.
  2. Omega Engineering, Inc.
  3. Weksler Glass Thermometer Corp.
  4. H.O. Trerice Co.
  5. Ametek Inc., U.S. Gauge Division

6. Weiss Instruments, Inc.
- B. Thermometer: ASTM E 1, adjustable angle, red appearing mercury, lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device.
  1. Size: 9 inch scale.
  2. Window: Clear Lexan.
  3. Stem: 3/4 inch NPT brass.
  4. Accuracy: 2 percent.
  5. Calibration: Degrees F.

## **2.05 THERMOMETER SUPPORTS**

- A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

## **2.06 TEST PLUGS**

- A. Manufacturers:
  1. SISCO (P/T Plugs)
  2. Peterson Equipment Co. (Pete's Plugs)
- B. Test Plug: 1/4 inch or 1/2 inch brass or stainless steel fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.

## **2.07 STATIC PRESSURE GAGES**

- A. Manufacturers:
  1. Dwyer Instruments, Inc.
  2. Omega Engineering, Inc.
  3. Weksler Glass Thermometer Corp.

- B. 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.
- C. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install pressure gages with pulsation dampers. Provide gage cock or needle valve to isolate each gage. Provide siphon on gages in steam systems. Extend nipples and siphons to allow clearance from insulation.
- C. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- D. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- E. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- F. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.
- G. Locate test plugs adjacent to thermometers and thermometer sockets, adjacent to pressure gages and pressure gage taps, adjacent to control device sockets, and where indicated.

### **3.02 SCHEDULE**

- A. Pressure Gage Tappings, Location:
  - 1. Control valves 3/4 inch and larger - inlets and outlets.
  - 2. Major coils - inlets and outlets.
- B. Stem Type Thermometers, Location and Scale Range:
  - 1. Coil banks - inlets and outlets, 0 to 240 degrees F.
  - 2. After major coils, 0 to 240 degrees F.

C. Thermometer Sockets, Location:

1. Control valves 1 inch and larger - inlets and outlets.
2. Reheat coils - inlets and outlets.

D. Static Pressure and Filter Gages, Location and Scale Range:

1. Supply fan discharge, 0 to 2 inches W.C.

**END OF SECTION 230519**



## **SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. This Section includes the following hangers and supports for HVAC system piping and equipment:
  - 1. Steel pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Metal framing systems.
  - 4. Thermal-hanger shield inserts.
  - 5. Fastener systems.
  - 6. Equipment supports.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ASME B31.9 - Building Services Piping; American Society of Mechanical Engineers.
- B. ASTM A36/A36M - Carbon Structural Steel; American Society for Testing and Materials.
- C. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; American Society for Testing and Materials.
- D. MFMA-4 - Metal Framing Standards; Metal Framing Manufacturers Association.
- E. MFMA-103 - Guidelines for the Use of Metal Framing; Metal Framing Manufacturers Association.
- F. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry.

- G. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry.
- H. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry.

#### **1.04 DEFINITIONS**

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

#### **1.05 PERFORMANCE REQUIREMENTS**

- A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.
- D. Piping systems shall be supported so as to maintain required pitch of pipes, prevent vibration, and provide for expansion and contraction movement.

#### **1.06 SUBMITTALS**

- A. Product Data: For the following:
  - 1. Steel pipe hangers and supports.
  - 2. Thermal-hanger shield inserts.
  - 3. Powder-actuated fastener 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.

2. Equipment supports.

## **PART 2 - PRODUCTS**

### **2.01 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.

### **2.02 STEEL PIPE HANGERS AND SUPPORTS**

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
  1. AAA Technology & Specialties Co., Inc.
  2. Bergen-Power Pipe Supports.
  3. B-Line Systems, Inc.; a division of Cooper Industries.
  4. Carpenter & Paterson, Inc.
  5. Empire Industries, Inc.
  6. ERICO/Michigan Hanger Co.
  7. Globe Pipe Hanger Products, Inc.
  8. Grinnell Corp.
  9. GS Metals Corp.
  10. National Pipe Hanger Corporation.

11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

### **2.03 TRAPEZE PIPE HANGERS**

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

### **2.04 METAL FRAMING SYSTEMS**

A. Description: MFMA-4, shop or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

## **2.05 THERMAL-HANGER SHIELD INSERTS**

- A. Description: 100-psig minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Manufacturers:
  - 1. Carpenter & Paterson, Inc.
  - 2. ERICO/Michigan Hanger Co.
  - 3. PHS Industries, Inc.
  - 4. Pipe Shields, Inc.
  - 5. Rilco Manufacturing Company, Inc.
  - 6. Value Engineered Products, Inc.
- C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate.
- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

## **2.06 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.
  - 1. Manufacturers:
    - a. Hilti, Inc.

- b. ITW Ramset/Red Head.
  - c. Masterset Fastening Systems, Inc.
  - d. MKT Fastening, LLC.
  - e. Powers Fasteners.
- B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- 1. Manufacturers:
    - a. B-Line Systems, Inc.; a division of Cooper Industries.
    - b. Empire Industries, Inc.
    - c. Hilti, Inc.
    - d. ITW Ramset/Red Head.
    - e. MKT Fastening, LLC.
    - f. Powers Fasteners.

## **2.07 EQUIPMENT SUPPORTS**

- A. Description: Welded, shop or field-fabricated equipment support made from structural-steel shapes.

## **PART 3 - EXECUTION**

### **3.01 HANGER AND SUPPORT APPLICATIONS**

- A. Specific hanger and support requirements are specified 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 padded hangers for piping that is subject to scratching.
- F. 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.
  - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
  - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
  - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
  - 5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, 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.
  - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
  - 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
  - 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
  - 10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
  - 11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
  - 12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.

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, with steel pipe base stanchion support and cast-iron floor flange.
  15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange 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, 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, from 2 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 20, 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, 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, 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, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- G. 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 for heavy loads.
  2. Steel Clevises (MSS Type 14): For 120 to 450 deg F 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 piping installations.

H. 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-joist 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.
  - b. Medium (MSS Type 32): 1500 lb.
  - c. Heavy (MSS Type 33): 3000 lb.

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.
- I. 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.
- J. 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.
  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 absorb 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 absorb 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 absorb 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.
- K. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- L. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- M. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

### **3.02 HANGER AND SUPPORT INSTALLATION**

- A. Steel 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 building structure.
- B. 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 above for individual pipe hangers.
  2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- 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 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. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

G. 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.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. 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 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.

J. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

L. Insulated Piping: Comply with the following:

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. Provide continuous vapor barrier.
  - c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.

2. 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 and larger if pipe is installed on rollers.
3. Shield Dimensions for Pipe: Not less than the following:
  - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
  - b. NPS 4: 12 inches long and 0.06 inch thick.
  - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
  - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
  - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
5. Pipes NPS 8 and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### **3.03 EQUIPMENT SUPPORTS**

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Provide lateral bracing, to prevent swaying, for equipment supports.

### **3.04 METAL FABRICATIONS**

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

### **3.05 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.

**END OF SECTION 230529**

## **SECTION 230548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Vibration isolators.
- B. Expected sound levels.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 SUBMITTALS**

- A. Product Data: Provide schedule of vibration isolator type with location, load, and deflection on each.
- B. Shop Drawings: Indicate inertia bases and locate vibration isolators, with static and dynamic load on each. Detail bases and select based on lowest operating speed of equipment. Indicate seismic control measures with load calculations, spacing, location and strut types.
- C. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

#### **1.04 APPLICABLE REQUIREMENTS**

- A. Expected noise levels in various parts of the building shall conform to noise criteria recommendations set forth in the 2015ASHRAE Handbook of HVAC Applications, Chapter 48.
- B. Equipment shall be selected so that RC(N) levels shall not exceed the following ranges:

Classrooms	25 to 30
Offices (private)	25 to 35
Office (open)	30 to 40
Laboratories	40 to 50
Auditoriums	20 to 25
Operating Rooms	25 to 35
Corridors	40 to 45
Conference Rooms	25 to 35

Patient Rooms	25 to 35
Music Rooms	30 to 35
Gymnasiums	40 to 50

- C. An allowance not to exceed 5 dB may be added to the measured sound value to compensate for the variation of the room attenuating effect between room test condition prior to occupancy and design conditions after occupancy, which may include the addition of sound absorbing materials, such as furniture. This allowance may not be taken after occupancy. The room attenuating effect is defined as the difference between sound power level emitted to room, and sound pressure level in room.
- D. Allowable vibration tolerances for rotating, non-reciprocating equipment shall not exceed a self-excited vibration maximum velocity of 0.20-inch per second RMS, filter in, when measured with a vibration meter on bearing caps of machine in vertical, horizontal and axial directions, or measured at equipment mounting feet if bearings are concealed. Measurements for internally isolated fans and motors may be made at the mounting feet.

## 1.05 APPLICATION

- A. Provide vibration isolators for all rotating and reciprocating equipment.
- B. For equipment which has no sound power ratings scheduled on the drawings, the contractor shall select equipment such that the noise criteria, local ordinance noise levels, and OSHA requirements are not exceeded. Selection procedure shall be in accordance with ASHRAE Fundamentals Handbook 2013, Chapter 8, Sound and Vibration.
- C. Provide seismic restraints as indicated, and as follows:
  - 1. All mechanical equipment not supported with isolators external to the unit shall be securely anchored to the structure. Such mechanical equipment shall be properly supported to resist a horizontal force, as determined in accordance with the International Building Code (IBC).
  - 2. All mechanical equipment mounted on vibration isolators shall be provided with seismic restraints capable of resisting a horizontal force, as determined in accordance with the IBC.
- D. Provide flexible duct connections at all air handling equipment, even if they are provided with internal fan isolation, and at the inlet and discharge of all fans.
- E. Provide flexible piping connections at chillers, condensers, cooling towers, air handling units and pumps.



## **1.06 RELATED DOCUMENTS**

- A. For seismic requirements by building type, hazard exposure and location, refer to the International Building Code (IBC), latest edition.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Isolation Technology, Inc.
- B. Kinetics Noise Control, Inc.
- C. Mason Industries
- D. Korfund/VMC
- E. Amber -Booth
- F. Vibration Eliminator Company

### **2.02 TECHNICAL REQUIREMENTS**

- A. Equipment driven by motors, 2 horsepower and smaller, shall be isolated by means of elastomeric mounts or elastomeric hangers, sized for 1/2-inch deflection. Larger equipment shall be isolated by means of open spring mounts or open spring hangers, sized for the specified deflection.
- B. Steel components shall be phosphatized and painted. Nuts, bolts and washers shall be zinc electroplated. Structural steel bases shall be cleaned of welding slag and primed with zinc chromate or metal etching primer.
- C. Isolators exposed to the weather shall have steel parts PVC coated or minimum of G-90 hot-dip galvanized. Aluminum components shall be etched and painted. Nuts, bolts and washers may be zinc electroplated.
- D. Elastomeric components shall be of neoprene or synthetic rubber with anti-ozone and anti-oxidant additives.

### **2.03 VIBRATION ISOLATORS**

- A. Spring Hanger (Type H, HS):

1. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
  2. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, or rubber hanger with threaded insert.
  3. Misalignment: Capable of 20 degree hanger rod misalignment.
  4. For Exterior and Humid Areas: Hot dipped galvanized housings and neoprene coated springs.
- B. Rubber Mount or Hanger (Type M): Molded rubber designed for 0.4 inch deflection with threaded insert.
- C. Seismic Snubbers:
1. Type: Non-directional and double acting unit consisting of interlocking steel members restrained by neoprene elements.
  2. Elements: Replaceable neoprene, minimum of 0.75 inch thick with minimum 1/8 inch air gap.
  3. Capacity: 4 times load assigned to mount groupings at 0.4 inch deflection.
  4. Attachment Points and Fasteners: Capable of withstanding three times rated load capacity of seismic snubber.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions. No metal-to-metal contact will be permitted between fixed and floating parts.
- C. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.
- D. Provide pairs of horizontal limit springs (thrust restraints, Type THR) on fans with more than 4.0 inches w.c. static pressure, and on hanger supported, horizontally mounted axial fans.

- E. Provide seismic snubbers for all equipment, piping, and ductwork mounted on isolators. Each inertia base shall have minimum of four seismic snubbers located close to isolators. Snub equipment designated for post-disaster use to 0.05 inch maximum clearance. Other snubbers shall have clearance between 0.15 inch and 0.25 inch.
- F. Support piping connections to equipment mounted on isolators using isolators or resilient hangers for scheduled distance, to nearest flexible pipe connector, or as follows:
  - 1. Up to 4 Inches Pipe Size: First three points of support.
  - 2. 5 to 8 Inches Pipe Size: First four points of support.
  - 3. 10 inches Pipe Size and Over: First six points of support.
  - 4. Select three hangers closest to vibration source for minimum 1.0 inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0 inch static deflection or 1/2 static deflection of isolated equipment.

### **3.02 FIELD QUALITY CONTROL**

- A. Inspect isolated equipment after installation and submit report. Include static deflections.
- B. In high wind areas, provide uplift resistance on spring isolators exposed to weather.

### **3.03 SCHEDULE**

- A. Pipe Isolation Schedule.
  - 1. 1 Inch Pipe Size: Isolate 120 diameters from equipment.
  - 2. 2 Inch Pipe Size: Isolate 90 diameters from equipment.
  - 3. 3 Inch Pipe Size: Isolate 80 diameters from equipment.
  - 4. 4 Inch Pipe Size: Isolate 75 diameters from equipment.
  - 5. 6 Inch Pipe Size: Isolate 60 diameters from equipment.
  - 6. 8 Inch Pipe Size: Isolate 60 diameters from equipment.
  - 7. 10 Inch Pipe Size: Isolate 54 diameters from equipment.
  - 8. 12 Inch Pipe Size: Isolate 50 diameters from equipment.

9. 16 Inch Pipe Size: Isolate 45 diameters from equipment.
10. 24 Inch Pipe Size: Isolate 38 diameters from equipment.
11. Over 24 Inch Pipe Size: As indicated.

B. Vibration isolators shall be installed where specified herein and where shown on the drawings, and as follows:

Equipment Type	Slab on Grade			Structural Spans up to 30-Feet Between Columns		
	<u>Base</u> <u>Deflection</u>	<u>Isolator</u>	<u>Min.</u>	<u>Base</u> <u>Deflection</u>	<u>Isolator</u>	<u>Min.</u>
Indoor electric chiller	--- 0.25"		P	--- 1.50"		SP
Indoor absorption chiller	--- 0.25"		P	--- 1.50"		SP
In-line pump (floor-mounted)	--- 0.75"		S	--- 1.50"		S
In-line pump (suspended)	--- ---		---	--- 1.50"		H
Base mounted pump, up to 7.5 HP	--- ---		---	I 0.75"		S,SP
Base mounted pump, 10 HP and up	--- ---		---	I 1.50"		S,SP
Cooling tower	--- 0.25"		P	--- 0.75"		SP
Heat pumps	--- 0.75"		S,H	--- 0.75"		S,H
Condensing Units	--- 0.25"		P	--- 1.50"		SP
Air-Cooled Chillers	--- 0.25"		P	--- 1.50"		SP
Air handling units/H&V unit, up to 4" TSP	--- 0.75"		S,SP	--- 1.50"		S,SP
Air handling units/H&V units, 4" TSP and up	R 0.75"		S,SP	I 2.50"		S,SP
Packaged rooftop units	Curb 0.25"		P	Curb 2.50"		S,SP

Air compressors	--- 0.75"	S,SP	I 1.50"	S,SP
Vacuum pumps	--- 0.75"	S,SP	I 1.50"	S,SP
Engine driven equipment	--- 0.75"	S,SP	I 2.50"	S,SP
Piping in Mechanical Rooms	--- 1.00"	H	--- 1.00"	H
Fan-powered VAV boxes	--- 0.75"	H	--- 0.75"	H
Air handling units/H&V units/ Axial fans with 2" TSP and up	--- 0.75"	THR	equal to --- spring isolators	THR
Axial fan up to 22" wheel (floor-mounted)	--- 0.25"	M	--- 0.75"	S
Axial fan up to 22" wheel (suspended)	--- ---	---	--- 0.75"	H
Axial fan, 24" wheel and up (floor-mounted)	--- 0.75"	S	I 1.50"	S
Centrifugal fan up to 22" wheel (floor-mounted)	R 0.25"	M	R 0.75"	S
Centrifugal fan up to 22" wheel (suspended)	--- ---	---	R 0.75"	H
Centrifugal fan 24" wheel and up (floor-mounted)	R 1.50"	S	R 1.50"	S,SP
Centrifugal fan 24" wheel and up (suspended)	--- ---	---	R 1.50"	H,HS
Centrifugal fan, 50 HP and larger (floor-mounted)	I 1.00"	S,SP	I 2.50"	S,SP
Computer room units	--- ---	---	--- 1.00"	SS

- C. Mount thrust restraints at the horizontal centerline of the air flow. Provide mounting brackets on both sides of flexible connection at fan discharge.
- D. Vibration isolators for small fans, air handling units and refrigerant compressors may be supplied as part of packaged equipment.

**END OF SECTION 230548**

## **SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe Markers.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers.

#### **1.04 SUBMITTALS**

- A. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Samples: Submit two labels and two valve tags.
- E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- F. Project Record Documents: Record actual locations of tagged valves.

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Brady Corporation

- B. Champion America, Inc.
- C. Seton Identification Products
- D. Marking Services, Inc. (MSI)

## **2.02 NAMEPLATES**

- A. Description: Laminated three-layer plastic with engraved letters.
  - 1. Letter Color: White.
  - 2. Letter Height: 1/2 inch.
  - 3. Background Color: Black, Red, Green, Yellow, or as directed.

## **2.03 TAGS**

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Metal Tags: Brass or aluminum with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- C. Chart: Typewritten letter size list in anodized aluminum frame.

## **2.04 STENCILS**

- A. Stencils: With clean cut symbols and letters of following size:
  - 1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
  - 2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
  - 3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
  - 4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
  - 5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.



6. Ductwork and Equipment: 2-1/2 inch high letters.

B. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.

## **2.05 PIPE MARKERS**

A. Color: Conform to ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

## **2.06 CEILING TACKS**

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:

1. Yellow - HVAC equipment

2. Red - Fire dampers/smoke dampers

3. Blue - Heating/cooling valves

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces for stencil painting.

### **3.02 INSTALLATION**

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates or stencil painting. Small devices, such as in-line pumps, may be identified with tags.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify thermostats relating to terminal boxes or valves with nameplates.
- I. Identify valves in main and branch piping with tags.
- J. Identify air terminal units and radiator valves with numbered tags.
- K. Tag automatic controls, instruments, and relays. Key to control schematic.
- L. Identify piping, concealed or exposed, with plastic pipe markers, plastic tape pipe markers, or stenciled painting. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- M. Identify ductwork with plastic nameplates, or stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- N. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.
- O. Provide non-fading weatherproof (metal) nameplate on all mechanical equipment exposed to the weather. If manufacturer does not provide suitable nameplate, contractor shall provide and affix nameplate to the equipment, listing make, model number, serial number, and relevant capacity and electrical data.

**END OF SECTION 230553**

## **SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic systems.
- C. Measurement of final operating condition of HVAC systems.
- D. Sound measurement of equipment operating conditions.
- E. Vibration measurement of equipment operating conditions.
- F. Commissioning activities.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 ALLOWANCES**

- A. Allowance includes testing, adjusting, and balancing of mechanical systems.

#### **1.04 REFERENCES**

- A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council.
- B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau.
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association.

## **1.05 SUBMITTALS**

- A. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
  - 1. Submit to Architect.
  - 2. Submit to the Commissioning Authority, Construction Manager, and HVAC controls contractor.
  - 3. Submit six weeks prior to starting the testing, adjusting, and balancing work.
  - 4. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
  - 5. Include at least the following in the plan:
    - a. Preface: An explanation of the intended use of the control system.
    - b. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
    - c. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
    - d. Identification and types of measurement instruments to be used and their most recent calibration date.
    - e. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
    - f. Final test report forms to be used.
    - g. Detailed step-by-step procedures for TAB work for each system and issue, including:
      - 1) Terminal flow calibration (for each terminal type).

- 2) Diffuser proportioning.
  - 3) Branch/submain proportioning.
  - 4) Total flow calculations.
  - 5) Rechecking.
  - 6) Diversity issues.
- h. Expected problems and solutions, etc.
- i. Criteria for using air flow straighteners or relocating flow stations and sensors; analogous explanations for the water side.
- j. Details of how TOTAL flow will be determined; for example:
- 1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
  - 2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.
- k. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.
- l. Confirmation of understanding of the outside air ventilation criteria under all conditions.
- m. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
- n. Method of checking building static and exhaust fan and/or relief damper capacity.
- o. Proposed selection points for sound measurements and sound measurement methods.
- p. Methods for making coil or other system plant capacity measurements, if specified.
- q. Time schedule for TAB work to be done in phases (by floor, etc.).
- r. Description of TAB work for areas to be built out later, if any.
- s. Time schedule for deferred or seasonal TAB work, if specified.
- t. False loading of systems to complete TAB work, if specified.

- u. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
  - v. Interstitial cavity differential pressure measurements and calculations, if specified.
  - w. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
  - x. Procedures for formal progress reports, including scope and frequency.
  - y. Procedures for formal deficiency reports, including scope, frequency and distribution.
- C. Field Logs: Submit at least once a week to Commissioning Authority, Construction Manager, and Architect; Engineer.
- D. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.
- E. Progress Reports.
- F. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
  - 1. Submit to the Commissioning Authority, Construction Manager, and HVAC controls contractor within two weeks after completion of testing, adjusting, and balancing.
  - 2. Revise TAB plan to reflect actual procedures and submit as part of final report.
  - 3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
  - 4. Provide reports in letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
  - 5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.

6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
7. Units of Measure: Report data in I-P (inch-pound) units only.
8. Include the following on the title page of each report:
  - a. Name of Testing, Adjusting, and Balancing Agency.
  - b. Address of Testing, Adjusting, and Balancing Agency.
  - c. Telephone number of Testing, Adjusting, and Balancing Agency.
  - d. Project name.
  - e. Project location.
  - f. Project Architect.
  - g. Project Engineer.
  - h. Project Contractor.
  - i. Project altitude.
  - j. Report date.
- G. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

## **PART 2 - PRODUCTS**

(Not Used)

## **PART 3 - EXECUTION**

### **3.01 GENERAL REQUIREMENTS**

- A. Perform total system balance in accordance with one of the following:
  1. AABC MN-1, AABC National Standards for Total System Balance.

2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
  3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
  4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
  5. Maintain at least one copy of the standard to be used at project site at all times.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
  2. Having minimum of three years documented experience.
  3. Certified by one of the following:
    - a. AABC, Associated Air Balance Council: upon completion submit AABC National Performance Guaranty.
    - b. NEBB, National Environmental Balancing Bureau.
    - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute.
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.
- F. TAB Supervisor Qualifications: Professional Engineer licensed in the State in which the Project is located.

### **3.02 EXAMINATION**

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:



1. Systems are started and operating in a safe and normal condition.
  2. Temperature control systems are installed complete and operable.
  3. Proper thermal overload protection is in place for electrical equipment.
  4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  5. Duct systems are clean of debris.
  6. Fans are rotating correctly.
  7. Fire and volume dampers are in place and open.
  8. Air coil fins are cleaned and combed.
  9. Access doors are closed and duct end caps are in place.
  10. Air outlets are installed and connected.
  11. Duct system leakage is minimized.
  12. Hydronic systems are flushed, filled, and vented.
  13. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.
- C. Beginning of work means acceptance of existing conditions.

### **3.03 PREPARATION**

- A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.
- C. Provide additional balancing devices as required.

### **3.04 INSTALLATION TOLERANCES**

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 10 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

### **3.05 RECORDING AND ADJUSTING**

- A. Field Logs: Maintain written logs including:
  - 1. Running log of events and issues.
  - 2. Discrepancies, deficient or uncompleted work by others.
  - 3. Contract interpretation requests.
  - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on the drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
- H. Check and adjust systems approximately six months after final acceptance and submit report.

### **3.06 AIR SYSTEM PROCEDURE**

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.
- M. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.

- N. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.
- O. On fan powered VAV boxes, adjust air flow switches for proper operation.
- P. Measure static pressure between laboratories, clean rooms and corridors. Adjust air flows to maintain pressure relationships indicated on the plans.
- Q. Measure static pressure between patient isolation rooms, anterooms and corridors. Adjust air flows to maintain pressure relationships indicated on the plans.

### **3.07 WATER SYSTEM PROCEDURE**

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

### **3.08 COMMISSIONING**

- A. Perform prerequisites prior to starting commissioning activities.
- B. Fill out Prefunctional Checklists for:
  - 1. Air side systems.
  - 2. Water side systems.
- C. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.

- D. Re-check minimum outdoor air intake flows and maximum and intermediate total airflow rates for 100 percent of the air handlers, plus a random sample equivalent to 20 percent of the final TAB report data as directed by Commissioning Authority.
1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
  2. Use the same test instruments as used in the original TAB work.
  3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
  4. For purposes of re-check, failure is defined as follows:
    - a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
    - b. Temperatures: Deviation of more than 1 degree F.
    - c. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
    - d. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.
  5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.
- E. In the presence of the Commissioning Authority, verify that:
1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
  2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.

3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.
- F. No seasonal tests are required.
- G. No further monitoring is required.
- H. No deferred testing is required.

### **3.09 SCOPE**

- A. Test, adjust, and balance the following:
  1. Fans
  2. Air Filters
  3. Air Terminal Units
  4. Air Inlets and Outlets

### **3.10 MINIMUM DATA TO BE REPORTED**

- A. Electric Motors:
  1. Manufacturer
  2. Model/Frame
  3. HP/BHP
  4. Phase, voltage, amperage; nameplate, actual, no load
  5. RPM
  6. Service factor
  7. Starter size, rating, heater elements
  8. Sheave Make/Size/Bore

B. V-Belt Drives:

1. Identification/location
2. Required driven RPM
3. Driven sheave, diameter and RPM
4. Belt, size and quantity
5. Motor sheave diameter and RPM
6. Center to center distance, maximum, minimum, and actual

C. Cooling Coils:

1. Identification/number
2. Location
3. Service
4. Manufacturer
5. Air flow, design and actual
6. Entering air DB temperature, design and actual
7. Entering air WB temperature, design and actual
8. Leaving air DB temperature, design and actual
9. Leaving air WB temperature, design and actual
10. Water flow, design and actual
11. Water pressure drop, design and actual
12. Entering water temperature, design and actual
13. Leaving water temperature, design and actual
14. Saturated suction temperature, design and actual

15. Air pressure drop, design and actual

D. Heating Coils:

1. Identification/number
2. Location
3. Service
4. Manufacturer
5. Air flow, design and actual
6. Water flow, design and actual
7. Water pressure drop, design and actual
8. Entering water temperature, design and actual
9. Leaving water temperature, design and actual
10. Entering air temperature, design and actual
11. Leaving air temperature, design and actual
12. Air pressure drop, design and actual

E. Return Air/Outside Air:

1. Identification/location
2. Design air flow
3. Actual air flow
4. Design return air flow
5. Actual return air flow
6. Design outside air flow
7. Actual outside air flow



8. Return air temperature
9. Outside air temperature
10. Required mixed air temperature
11. Actual mixed air temperature
12. Design outside/return air ratio
13. Actual outside/return air ratio

F. Duct Traverses:

1. System zone/branch
2. Duct size
3. Area
4. Design velocity
5. Design air flow
6. Test velocity
7. Test air flow
8. Duct static pressure
9. Air temperature
10. Air correction factor

G. Duct Leak Tests:

1. Description of ductwork under test
2. Duct design operating pressure
3. Duct design test static pressure
4. Duct capacity, air flow

5. Maximum allowable leakage duct capacity times leak factor
6. Test apparatus
  - a. Blower
  - b. Orifice, tube size

H. Terminal Unit Data:

1. Manufacturer
2. Type, constant, variable, single, dual duct
3. Identification/number
4. Location
5. Model number
6. Size
7. Minimum static pressure
8. Minimum design air flow
9. Maximum design air flow
10. Maximum actual air flow
11. Inlet static pressure

I. Air Distribution Tests:

1. Air terminal number
2. Room number/location
3. Terminal type
4. Terminal size
5. Area factor

6. Design velocity
7. Design air flow
8. Test (final) velocity
9. Test (final) air flow
10. Percent of design air flow

J. Sound Level Reports:

1. Location
2. Octave bands - equipment off
3. Octave bands - equipment on

K. Vibration Tests:

1. Location of points:
  - a. Fan bearing, drive end
  - b. Fan bearing, opposite end
  - c. Motor bearing, center (if applicable)
  - d. Motor bearing, drive end
  - e. Motor bearing, opposite end
  - f. Casing (bottom or top)
  - g. Casing (side)
  - h. Duct after flexible connection (discharge)
  - i. Duct after flexible connection (suction)
2. Test readings:
  - a. Horizontal, velocity and displacement

- b. Vertical, velocity and displacement
  - c. Axial, velocity and displacement
- 3. Normally acceptable readings, velocity and acceleration
- 4. Unusual conditions at time of test
- 5. Vibration source (if non-complying)

**END OF SECTION 230593**

## **SECTION 230713 - DUCT INSULATION**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Duct insulation.
- B. Insulation jackets.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- C. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- D. ASTM C 553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- E. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- F. ASTM C 1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
- G. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials.
- I. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- J. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association.

- K. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.
- L. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.
- M. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Samples: Submit two samples of any representative size illustrating each insulation type.
- C. Manufacturer's Instructions: Indicate installation procedures which ensure acceptable workmanship and installation standards will be achieved.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience.

#### **1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

#### **1.07 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

## **PART 2 - PRODUCTS**

### **2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

### **2.02 GLASS FIBER, FLEXIBLE**

- A. Manufacturer:
  - 1. Knauf Fiber Glass
  - 2. Johns Manville Corporation
  - 3. Owens Corning Corp
  - 4. CertainTeed Corporation;
- B. Insulation: ASTM C 553; flexible, noncombustible blanket.
  - 1. 'K' value: 0.30 at 75 degrees F, when tested in accordance with ASTM C 518.
  - 2. Maximum Service Temperature: 450 degrees F.
  - 3. Maximum Water Vapor Sorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E 96/E 96M.
  - 3. Secure with pressure sensitive tape.
- D. Vapor Barrier Tape:
  - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive. Compatible with insulation manufacturer's vapor barrier.
- E. Tie Wire: Annealed steel, 16 gage.

## **2.03 GLASS FIBER, RIGID**

### **A. Manufacturer:**

1. Knauf Fiber Glass
2. Johns Manville Corporation
3. Owens Corning Corp
4. CertainTeed Corporation;

### **B. Insulation: ASTM C 612; rigid, noncombustible blanket.**

1. 'K' value: 0.24 at 75 degrees F, when tested in accordance with ASTM C 518.
2. Maximum service temperature: 450 degrees F.
3. Maximum Water Vapor Sorption: 5.0 percent.
4. Maximum Density: 8.0 lb./cu. ft.

### **C. Vapor Barrier Jacket:**

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E 96/E 96M.
3. Secure with pressure sensitive tape.

### **D. Vapor Barrier Tape:**

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive. Compatible with insulation manufacturer's vapor barrier.

## **2.04 JACKETS**

### **A. Canvas Jacket: UL listed 6 oz/sq. yd. plain weave cotton fabric treated with dilute fire retardant lagging adhesive.**

1. Lagging Adhesive:



- a. Compatible with insulation.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated ducts conveying air below ambient temperature:
  - 1. Provide insulation with vapor barrier jackets.
  - 2. Finish with tape and vapor barrier jacket.
  - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
  - 5. Insulate body of all supply air diffusers and registers.
- D. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with canvas jacket sized for finish painting or aluminum jacket.
- E. Metal Corner Reinforcement:
  - 1. Provide insulation stops and metal corner reinforcement at all openings in insulation for access doors, panels, control instruments, and damper operators.
  - 2. Fabricate from galvanized steel, and finish with no raw edges showing.
- F. Provide 20-mil thickness PVC jacket on all ductwork, color as directed.

### **3.03 SCHEDULES**

- A. Plenums: Rigid board, 2 inches thick.

- B. Supply ducts After Terminal Boxes: Flexible wrap, 1-1/2 inches thick.
- C. Return Ducts Above Ceilings: Flexible wrap, 1-1/2 inches thick.
- D. Existing Insulation Damaged by New Work: Repair and seal to match existing thickness and conditions.

**END OF SECTION 230713**

## **SECTION 230719 - HVAC PIPING INSULATION**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Piping insulation.
- B. Jackets and accessories.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- D. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.
- E. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- F. ASTM C 585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
- G. ASTM C 795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
- H. ASTM D 2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
- I. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- J. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials.

- K. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association.
- L. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc..

#### **1.04 SUBMITTALS**

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Samples: Submit two samples of any representative size illustrating each insulation type.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

#### **1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

#### **1.07 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

### **PART 2 - PRODUCTS**

#### **2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

## **2.02 GLASS FIBER**

### **A. Manufacturers:**

1. Knauf Fiber Glass
2. Johns Manville Corporation
3. Owens Corning Corp
4. CertainTeed Corporation

### **B. Insulation: ASTM C 547 rigid molded, noncombustible.**

1. 'K' value: ASTM C 177, 0.24 at 75 degrees F.
2. Maximum service temperature: 850 degrees F or 1200 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.

### **C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96/E 96M of 0.02 perm-inches.**

### **D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.**

### **E. Vapor Barrier Lap Adhesive:**

1. Compatible with insulation.

### **F. Fibrous Glass Fabric:**

1. Cloth: Untreated; 9 oz./sq. yd. weight.
2. Blanket: 1.0 lb./cu. ft.
3. Weave: 5x5.

### **G. Indoor Vapor Barrier Finish:**

1. Cloth: Untreated; 9 oz./sq. yd. weight.
2. Vinyl emulsion type acrylic, compatible with insulation, color as directed.

## **2.03 JACKETS**

### **A. PVC Plastic.**

1. Manufacturers:
  - a. Johns Manville Corporation
2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
  - a. Minimum Service Temperature: 0 degrees F.
  - b. Maximum Service Temperature: 150 degrees F.
  - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E 96/E 96M.
  - d. Thickness: Minimum 10 mil.
  - e. Connections: Brush on welding adhesive, or pressure sensitive color matching vinyl tape.
3. Covering Adhesive Mastic:
  - a. Compatible with insulation.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.

- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
  - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- H. Glass fiber insulated pipes conveying fluids above ambient temperature:
  - 1. Provide standard jackets, with vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
  - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- I. Inserts and Shields:
  - 1. Application: Piping 1-1/2 inches diameter or larger.
  - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  - 3. Insert location: Between support shield and piping and under the finish jacket.
  - 4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
  - 5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.

- K. Existing insulation damaged by new work shall be repaired and finished to match original new condition.
- L. Insulation at grooved-end pipe couplings and flanged connections shall be full thickness of adjacent pipe insulation. Seal ends of insulation sections to provide continuous vapor barrier.
- M. Elastomeric insulation exposed to the weather shall be coated with manufacturer's ultra-violet resistant coating.

### **3.03 SCHEDULE**

#### **A. Heating Systems:**

- 1. Heating Water Supply and Return: Fiberglass, 1-1/2 inch thick for pipes less than or equal to 1-1/2- inches, 2-inch thick for pipes greater than 1-1/2-inches.

**END OF SECTION 230719**



## **SECTION 230800 - COMMISSIONING OF HVAC**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. See Section 01 9113, General Commissioning Requirements, for overall objectives; comply with the requirements of Section 01 9113.
- B. This section covers the Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.
- C. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.
- D. The following HVAC equipment is to be commissioned, including commissioning activities for the following specific items:
  - 1. Control system.
  - 2. Major and minor equipment items.
  - 3. Piping systems and equipment.
  - 4. Ductwork and accessories.
  - 5. Terminal units.
  - 6. Sound control devices.
  - 7. Vibration control devices.
  - g. Garage exhaust.
  - 8. Indoor Air Quality Procedures: The Commissioning Authority will coordinate; Contractor will execute.
- E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

## **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

## **1.03 REFERENCES**

- A. ASHRAE Guideline 1 - The HVAC Commissioning Process; 1996

## **1.04 SUBMITTALS**

- A. HVAC Control System Documentation: Submit detailed sequences of operation, control system drawings, and points list.
  - 1. Incorporate the sequence of operation information specified in other HVAC specification sections.
  - 2. Incorporate the shop drawing submittal information specified in the HVAC control system section.
  - 3. Submittals prepared for other sections may be used in preparation of this documentation.
- B. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.
- C. Draft Prefunctional Checklists and Functional Test Procedures for Control System: Detailed written plan indicating the procedures to be followed to test, checkout and adjust the control system prior to full system Functional Testing; include at least the following for each type of equipment controlled:
  - 1. System name.
  - 2. List of devices.
  - 3. Step-by-step procedures for testing each controller after installation, including:
    - a. Process of verifying proper hardware and wiring installation.
    - b. Process of downloading programs to local controllers and verifying that they are addressed correctly.
    - c. Process of performing operational checks of each controlled component.
    - d. Plan and process for calibrating valve and damper actuators and all sensors.

- e. Description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
  - 4. Copy of proposed log and field checkout sheets to be used to document the process; include space for initial and final read values during calibration of each point and space to specifically indicate when a sensor or controller has “passed” and is operating within the contract parameters.
  - 5. Description of the instrumentation required for testing.
  - 6. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the Commissioning Authority and TAB contractor for this determination.
- D. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.
- E. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:
- 1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
  - 2. Full as-built set of control drawings.
  - 3. Full as-built sequence of operations for each piece of equipment.
  - 4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
    - a. Floor.
    - b. Room number.
    - c. Room name.
    - d. Reference drawing number.
    - e. Air terminal unit tag ID.

- f. Heating and/or cooling valve tag ID.
  - g. Minimum air flow rate.
  - h. Maximum air flow rate.
- 5. Full print out of all schedules and set points after testing and acceptance of the system.
- 6. Full as-built print out of software program.
- 7. Electronic copy on disk of the entire program for this facility.
- 8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
- 9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
- 10. Control equipment component submittals, parts lists, etc.
- 11. Warranty requirements.
- 12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
- 13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
  - a. Sequences of operation.
  - b. Control drawings.
  - c. Points lists.
  - d. Controller and/or module data.
  - e. Thermostats and timers.
  - f. Sensors and DP switches.
  - g. Valves and valve actuators.
  - h. Dampers and damper actuators.

- i. Program setups (software program printouts).
- F. Project Record Documents:
  - 1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
  - 2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.
- G. Draft Training Plan:
  - 1. Follow the recommendations of ASHRAE Guideline 1.
  - 2. Control system manufacturer's recommended training.
  - 3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.
- H. Training Manuals:
  - 1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

## **PART 2 - PRODUCTS**

### **2.01 TEST EQUIPMENT**

- A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Cooperate with the Commissioning Authority in development of the Prefunctional Checklists and Functional Test Procedures.

- B. Furnish additional information requested by the Commissioning Authority.
- C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.
- D. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.
- E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.
  - 1. Include cost of sheaves and belts that may be required for testing, adjusting, and balancing.
- F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.
- G. Provide temperature and pressure taps in accordance with the contract documents.
  - 1. Provide a pressure/temperature plug at each water sensor which is an input point to the control system.

### **3.02 INSPECTING AND TESTING - GENERAL**

- A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.
- B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.
- C. Provide two-way radios for use during the testing.
- D. Valve/Damper Stroke Setup and Check:
  - 1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
  - 2. Set pump/fan to normal operating mode.
  - 3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.

4. Command valve/damper open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
7. Closure for Heating Coil Valves - Normally Open:
  - a. Set heating setpoint 20 degrees F above room temperature.
  - b. Observe valve open.
  - c. Remove control air or power from the valve and verify that the valve stem and actuator position do not change.
  - d. Restore to normal.
  - e. Set heating setpoint to 20 degrees F below room temperature.
  - f. Observe the valve close.
  - g. For pneumatics, by override in the control system, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change.
  - h. Restore to normal.
8. Closure for Cooling Coil Valves - Normally Closed:
  - a. Set cooling setpoint 20 degrees F above room temperature.
  - b. Observe the valve close.
  - c. Remove control air or power from the valve and verify that the valve stem and actuator position do not change.
  - d. Restore to normal.
  - e. Set cooling setpoint to 20 degrees F below room temperature.
  - f. Observe valve open.

- g. For pneumatics, by override in the control system, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change.
    - h. Restore to normal.
  - E. Coil Valve Leak Check:
    - 1. Method 1 - Water Temperature With 2-Way Valve:
      - a. Calibrate water temperature sensors on each side of coil to be within 0.2 degree F of each other.
      - b. Turn off air handler fans, close outside air dampers. Keep pump running. Make sure appropriate coil dampers are open.
      - c. Normally closed valves will close.
      - d. Override normally open valves to the closed position.
      - e. After 10 minutes observe water delta T across coil. If it is greater than 2 degrees F, leakage is probably occurring.
      - f. Reset valve stroke to close tighter.
      - g. Repeat test until compliance is achieved.
    - 2. Method 2 - Air Temperature With 2 or 3-Way Valve: Water leak-by less than 10 percent will likely not be detected with this method.
      - a. Calibrate air temperature sensors on each side of coil to be within 0.2 degree F of each other.
      - b. Air handler fans should be on.
      - c. Change mixed or discharge air setpoint, override values or bleed or squeeze bulb pneumatic controller to cause the valve to close.
      - d. After 5 minutes observe air delta T across coil. If it is greater than one degree F, leakage is probably occurring.
      - e. Reset valve stroke to close tighter.
      - f. Repeat test until compliance is achieved.



3. Method 3 - Coil Drain Down: Not for 3-way valves.
  - a. Put systems in normal mode.
  - b. If cooling coil valve, remove all call for cooling; if heating coil valve, put system in full cooling.
  - c. Close isolation valve on supply side of coil, open air bleed cap, open drain-down cock and drain water from coil.
  - d. If water does not stop draining, there may be a leak through the control valve.
  - e. Return all to normal when done.
- F. Isolation Valve or System Valve Leak Check: For valves not by coils.
  1. With full pressure in the system, command valve closed.
  2. Use an ultra-sonic flow meter to detect flow or leakage.
- G. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

### **3.03 TAB COORDINATION**

- A. TAB: Testing, adjusting, and balancing of HVAC.
- B. Coordinate commissioning schedule with TAB schedule.
- C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.
- D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.
- E. Have all required Prefunctional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the Commissioning Authority prior to starting TAB.
- F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

### **3.04 CONTROL SYSTEM FUNCTIONAL TESTING**

- A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the requirements of the Contract Documents and the detailed Sequences of Operation documentation submittal.
- B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with the contract documents.
- C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the Commissioning Authority.
- D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.
  - 1. The scope of trend logging is partially specified; trend log up to 50 percent more points than specified at no extra cost to Owner.
  - 2. Perform all trend logging specified in Prefunctional Checklists and Functional Test procedures.
- E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.
- F. Demonstrate the following to the Commissioning Authority during testing of controlled equipment; coordinate with commissioning of equipment.
  - 1. Setpoint changing features and functions.
  - 2. Sensor calibrations.
- G. Demonstrate to the Commissioning Authority:
  - 1. That all specified functions and features are set up, debugged and fully operable.
  - 2. That scheduling features are fully functional and setup, including holidays.
  - 3. That all graphic screens and value readouts are completed.
  - 4. Correct date and time setting in central computer.

5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner.
6. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner.
7. Power failure and battery backup and power-up restart functions.
8. Global commands features.
9. Security and access codes.
10. Occupant over-rides (manual, telephone, key, keypad, etc.).
11. O&M schedules and alarms.
12. Occupancy sensors and controls.
13. "After hours" use tracking and billing.
14. Communications to remote sites.
15. Fire alarm interlocks and response.
16. Fire protection and suppression systems interfaces.
17. Security system interlocks.
18. That points that are monitored only, having no control function, are reporting properly to the control system.
19. All control strategies and sequences not tested during controlled equipment testing.
20. Trend logging and graphing features that are specified.
21. Other integrated tests specified in the contract documents
22. That control system features that are included but not specified to be setup are actually installed.

- H. Perform and submit trend logging on the following using the control system, for minimum period of five days, including one weekend, if the control points are monitored by the control system:
  - 1. Duty cycling, if specified.
  - 2. Demand limiting, including over-ride of limiting.
  - 3. Sequential staging ON of equipment; optionally demonstrate manually.
  - 4. Optimum start-stop functions.
  - 5. Miscellaneous equipment current or status for duty cycling and demand limiting.
  - 6. Equipment or building kW or current for demand limiting.
  - 7. Equipment optimum start/stop functions.
- I. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

### **3.05 OPERATION AND MAINTENANCE MANUALS**

- A. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.
- B. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.
- C. Commissioning Authority will add commissioning records to manuals after submission to Owner.

### **3.06 DEMONSTRATION AND TRAINING**

- A. Demonstrate operation and maintenance of HVAC system to Owner' personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.
- B. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to the Commissioning Authority during Functional Testing.

- C. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Provide the following minimum durations of training:
1. HVAC Control System: \_\_\_\_ hours.
  2. Piping Systems: \_\_\_\_ hours.
  3. Air Terminal Units: \_\_\_\_ hours.
- D. TAB Review: Instruct Owner's personnel for minimum \_\_\_\_ hours, after completion of TAB, on the following:
1. Review final TAB report, explaining the layout and meanings of each data type.
  2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
  3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
  4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
  5. Other salient information that may be useful for facility operations, relative to TAB.
- E. HVAC Control System Training: Perform training in at least three phases:
1. Phase 1 - Basic Control System: Provide minimum of \_\_\_\_ hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
    - a. This training may be held on-site or at the manufacturer's facility.
    - b. If held off-site, the training may occur prior to final completion of the system installation.
    - c. For off-site training, Contractor shall pay expenses of up to two attendees.
  2. Phase 2 - Integrating with HVAC Systems: Provide minimum of \_\_\_\_ hours of on-site, hands-on training after completion of Functional Testing. Include instruction on:

- a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.
  - b. Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
  - c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.
  - d. Every display screen, allowing time for questions.
  - e. Use of keypad or plug-in laptop computer at the zone level.
  - f. Use of remote access to the system via phone lines or networks.
  - g. Setting up and changing an air terminal unit controller.
  - h. Graphics generation.
  - i. Point database entry and modifications.
  - j. Understanding DDC field panel operating programming, when applicable.
3. Phase 3 - Post-Occupancy: Six months after occupancy conduct minimum of \_\_\_\_ hours of training. Tailor training session to questions and topics solicited beforehand from Owner. Also be prepared to address topics brought up and answer questions concerning operation of the system.
- F. Provide the services of manufacturer representatives to assist instructors where necessary.
- G. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

**END OF SECTION 230800**

## **SECTION 232113 - HYDRONIC PIPING**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Pipe and pipe fittings for:
  - 1. Heating water piping system.
  - 2. Chilled water piping system.
- B. Valves:
  - 1. Ball valves.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers.
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; (ANSI B16.18).
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers.
- D. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; (ANSI/ASME B31.9).
- E. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- F. ASTM A 234/A 234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
- G. ASTM B 32 - Standard Specification for Solder Metal.

- H. ASTM B 88 - Standard Specification for Seamless Copper Water Tube.
- I. ASTM B 88M - Standard Specification for Seamless Copper Water Tube (Metric).
- J. ASTM F 708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society.
- L. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.

#### **1.04 SYSTEM DESCRIPTION**

- A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Use grooved mechanical couplings and fasteners in accessible locations.
- C. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- D. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.
- E. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-69, unless indicated otherwise.
- F. Use gate, ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- G. Use globe, ball, or butterfly valves for throttling, bypass, or manual flow control services.
- H. Use 3/4 inch gate or ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.

#### **1.05 SUBMITTALS**

- A. Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.
- B. Welders Certificate: Include welders certification of compliance with ASME (BPV IX), or AWS D1.1.



- C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.
- D. Project Record Documents: Record actual locations of valves.
- E. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

#### **1.06 QUALITY ASSURANCE**

- A. Manufacturer: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.
- B. Installer: Company specializing in performing work of the type specified in this section, with minimum three years of experience.
- C. Welders: Certify in accordance with ASME (BPV IX), or AWS D1.1.

#### **1.07 REGULATORY REQUIREMENTS**

- A. Conform to ASME B31.9 code for installation of piping system.
- B. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of welders.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

#### **1.09 EXTRA MATERIALS**

- A. Provide two repacking kits for each size and valve type.

## **PART 2 - PRODUCTS**

### **2.01 HEATING WATER AND GLYCOL PIPING, ABOVE GROUND**

- A. Steel Pipe: ASTM A 53/A 53M, Schedule 40, black.
  - 1. Fittings: ASTM B 16.3, malleable iron or ASTM A 234/A 234M, wrought steel welding type fittings.
  - 2. Joints: Threaded, or AWS D1.1 welded.
- B. Steel Pipe Sizes 12 Inch and Over: ASTM A 53/A 53M, 0.375 inch wall, black.
  - 1. Fittings: ASTM A 234/A 234M, wrought steel welding type fittings.
  - 2. Joints: Welded in accordance with AWS D1.1.
- C. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), drawn.
  - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.
  - 2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
  - 3. Joints: Solder, lead free, 95-5 tin-antimony, or tin and silver, Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, or Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy.

### **2.02 CHILLED WATER PIPING, ABOVE GRADE**

- A. Steel Pipe: ASTM A 53/A 53M, Schedule 40, black.
  - 1. Fittings: ASME B16.3, malleable iron or ASTM A 234/A 234M, wrought steel welding type.
  - 2. Joints: Threaded or AWS D1.1 welded.
- B. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), hard drawn.
  - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.
  - 2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
  - 3. Joints: Solder, lead free, ASTM B 32, HB alloy (95-5 tin-antimony), or tin and silver, or Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy.

## **2.03 EQUIPMENT DRAINS AND OVERFLOWS**

- A. Copper Tube: ASTM B 88 (ASTM B 88M), Type L (B), drawn.
  - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
  - 2. Joints: Solder, lead free, ASTM B 32, HB alloy (95-5 tin-antimony), or tin and silver.
- B. PVC Pipe: ASTM D 1785, Schedule 40, or ASTM D 2241, SDR 21 or 26.
  - 1. Fittings: ASTM D 2466 or D2467, PVC.
  - 2. Joints: Solvent welded.

## **2.04 PIPE HANGERS AND SUPPORTS**

- A. Conform to ASME B31.9, ASTM F708, MSS SP-58, MSS SP-69, or MSS SP-89.
- B. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
- C. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
- D. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
- E. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- F. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
- G. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
- H. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- I. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- J. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

## **2.05 UNIONS, FLANGES, AND COUPLINGS**

- A. Unions for Pipe 2 Inches and Under:

1. Ferrous Piping: 150 psig malleable iron, threaded.
  2. Copper Pipe: Bronze, soldered joints.
- B. Flanges for Pipe Over 2 Inches:
1. Ferrous Piping: 150 psig forged steel, slip-on.
  2. Copper Piping: Bronze.
  3. Gaskets: 1/16 inch thick preformed neoprene.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

## **2.06 BALL VALVES**

- A. Manufacturers:
1. Conbraco Industries
  2. Nibco, Inc.
  3. Milwaukee Valve Company
  4. Grinnell
- B. Up To and Including 2 Inches:
1. Bronze one or two piece body, chrome plated brass or stainless steel ball, Teflon seats and stuffing box ring, lever handle, solder or threaded ends.
- C. Over 2 Inches:
1. Cast steel body, chrome plated steel ball, Teflon seat and stuffing box seals, lever handle, flanged.

## **2.07 FLEXIBLE PIPE AND FLEXIBLE CONNECTIONS**

- A. Flexible pipe for water piping systems in sizes 3-inches and smaller shall be corrugated bronze with single braided metallic jacket and suitable for a working pressure of 150 psi. They shall not be more less than 24 inches long. When used in copper tubing lines, the ends shall be suitable for soldered connections. When used in steel lines, the ends shall be flanged.

- B. Flexible pipe for water piping system sizes 4 inches and larger shall be stainless steel interlocked pressure hose suitable for a working pressure of 150 psi. They shall not be more than 24 inches long, and shall have flanged ends. Packing shall be of the type required to insure a leakproof hose under all operating conditions.
- C. The lines on each side of each section of flexible pipe shall be suitably anchored to prevent elongation of the flexible section under pressure.
- D. Flexible piping of water systems shall be equal to Flex-Hose Co., Inc., Metraflex or Resistoflex.
- E. Dual sphere flexible piping connectors shall have floating flanged ends and shall be manufactured of multi-layered polyester tire cord fabric reinforced with peroxide cured EPDM cover liner and fabric frictioning. Connectors shall be rated a minimum of 190 psi at 230 degrees F for standard construction, and 240 psi for 230 degrees F for high pressure.
- F. Flexible pipe connections shall be Vibration Mounting and Control type VMT, or similar product by Mason Industries, Kinetics Noise Control, or approved equal.

## **2.08 NIPPLES**

- A. All nipples shall be of the same material and thickness as the pipe with which they are used. Close nipped shall be used in approved locations only.

## **2.09 GASKETS**

- A. Gaskets for flanges shall be ring type of 1/16 inch sheet packing suitable for the service involved.

# **PART 3 - EXECUTION**

## **3.01 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install heating water, glycol, chilled water, condenser water, and engine exhaust piping to ASME B31.9 requirements.
- C. PVC Pipe: Make solvent-welded joints in accordance with ASTM D 2855.
- D. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- E. Install piping to conserve building space and to avoid interfere with use of space.
- F. Group piping whenever practical at common elevations.
- G. Sleeve pipe passing through partitions, walls and floors.
- H. Slope piping and arrange to drain at low points.
- I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- J. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- K. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-89.
  - 2. Support horizontal piping as scheduled.
  - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 4. Place hangers within 12 inches of each horizontal elbow.
  - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  - 7. Provide copper plated hangers and supports for copper piping.

- L. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- M. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- N. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
- O. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- P. Install valves with stems upright or horizontal, not inverted.

### **3.03 SCHEDULES**

- A. Hanger Spacing for Metal Piping and Tubing.
  - 1. 1/2 inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
  - 2. 1 inch: Maximum span, 6 feet; minimum rod size, 3/8 inch.
  - 3. 1-1/2 inch and 2 inch: Maximum span, 8 feet; minimum rod size, 3/8 inch.
  - 4. 2-1/2 inch: Maximum span, 9 feet; minimum rod size, 3/8 inch.

**END OF SECTION 232113**

## **SECTION 232114 - HYDRONIC SPECIALTIES**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Strainers.
- B. Flow indicators, controls, meters.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ASME - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description, model and dimensions.
- B. Certificates: Inspection certificates for pressure vessels from authority having jurisdiction.
- C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.
- D. Project Record Documents: Record actual locations of flow controls and flow meters.
- E. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.



- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

#### **1.07 MAINTENANCE SERVICE**

- A. Furnish service and maintenance of glycol system for one year from date of substantial completion.
- B. Perform monthly visit to make glycol fluid concentration analysis on site with refractive index measurement instrument. Detail findings with maintenance personnel in writing of corrective actions needed including analysis and amounts of glycol or water added.

#### **1.08 EXTRA MATERIALS**

- A. See Section 01 6000 - Project Requirements, for additional provisions.
- B. Provide one extra [1 gallon] [10 gallon], [55 gallon], drum of [ethylene] or [propylene] glycol.

### **PART 2 - PRODUCTS**

#### **2.01 AIR VENTS**

- A. Manufacturers:
  - 1. Armstrong International, Inc.
  - 2. ITT Bell & Gossett
  - 3. Taco, Inc.
  - 4. Spirax/Sarco
- B. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.
- C. Float Type:

1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
  2. Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.
- D. Washer Type:
1. Brass with hygroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

## **2.02 FLOW CONTROLS**

A. Manufacturers:

1. Amtrol Inc.
2. ITT Bell & Gossett.
3. Cla-Val Co.
4. Flow Design, Inc.
5. Griswold

- B. Construction: Brass or bronze body with union on inlet in sizes up to 2 inches, flanged or lug end in larger sizes, temperature and pressure test plug on inlet and outlet.
- C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum pressure drop, 3.5 psi at full flow.
- D. Control Mechanism: Stainless steel or nickel plated brass piston or regulator cup, operating against stainless steel helical or wave formed spring.
- E. Accessories: In-line strainer on inlet and ball valve on outlet.

## **2.03 FLOW METERS**

A. Manufacturers:

1. Dwyer Instruments, Inc.
2. EMCO Flow Systems

3. GE Infrastructure Sensing/GE Panametrics
- B. Orifice principle by-pass circuit with direct reading gage, soldered or flanged piping connections for 125 psi working pressure, with shut off valves, and drain and vent connections.
  - C. Direct reading with insert pitot tube, threaded coupling, for 150 psi working pressure, maximum 240 degrees F, 5 percent accuracy.
  - D. Cast iron, wafer type, orifice insert flow meter for 250 psi working pressure, with read-out valves equipped with integral check valves with gasketed caps.
  - E. Calibrated, plug type balance valve with precision machined orifice, readout valves equipped with integral check valves and gasketed caps, calibrated nameplate and indicating pointer.
  - F. Cast iron or bronze, globe style, balance valve with handwheel with vernier type ring setting and memory stop, readout valves.
  - G. Portable meter consisting of case containing one, 3 percent accuracy pressure gage with 0-60 feet pressure range for 500 psi maximum working pressure, color coded hoses for low and high pressure connections, and connectors suitable for connection to read-out valves.
  - H. Portable meter consisting of case containing two, 3 percent accuracy pressure gages with 0-135 inches and 0-60 feet pressure ranges for 500 psi maximum working pressure, color coded hoses for low and high pressure connections, and connectors suitable for connection to read-out valves.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install specialties in accordance with manufacturer's instructions.
- B. Where large air quantities can accumulate, provide enlarged air collection standpipes.
- C. Provide manual air vents at system high points and as indicated.
- D. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
- E. Provide manual air vent on all heat transfer coils, unit heaters, and radiation.

**END OF SECTION 232114**

## **SECTION 233100 - HVAC DUCTS AND CASINGS**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Metal ductwork.
- B. Casing and plenums.
- C. Duct cleaning.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- C. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened.
- D. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- E. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- F. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- G. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association.
- H. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association.

- I. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association.
- J. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.
- K. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.

#### **1.04 PERFORMANCE REQUIREMENTS**

- A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide data for duct materials, duct liner, and duct connections.
- B. Shop Drawings shall:
  - 1. Be 3/8-inch scale and shall indicate all ceiling obstructions, including, but not limited to, sprinkler heads, ceiling inserts, lighting fixtures, and other ceiling or slab mounted devices that could interfere with the installation of the work.
  - 2. Show fabrication, assembly and installation, including plans, elevations, sections, components and attachments to other work.
  - 3. Show factory and shop fabricated ducts and fittings.
  - 4. Include duct layout indicating sizes, configuration, liner material, and static pressure classes.
  - 5. Indicate elevation of top of ducts.
  - 6. Indicate dimensions of main duct runs from building grid lines.
  - 7. Indicate fittings.
  - 8. Indicate reinforcement and spacing.
  - 9. Show seam and join construction.
  - 10. Show penetrations through fire-rated and other partitions.

11. Show equipment installation based on equipment being used on project.
  12. Indicate locations for duct accessories, including dampers, turning vanes, and access doors and panels.
  13. Indicate hangers and supports, including methods for duct and building attachment, and vibration isolation.
- C. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
  2. Suspended ceiling components.
  3. Structural members to which duct will be attached.
  4. Size and location of initial access modules for acoustical tile.
  5. Penetrations of smoke barriers and fire-rated construction.
  6. Items penetrating finished ceiling, including, but not limited to, the following:
    - a. Lighting fixtures
    - b. Air outlets and inlets
    - c. Sprinkler
    - d. Access panels
- D. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.
- E. Manufacturer's Installation Instructions: Indicate special procedures for glass fiber ducts.
- F. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

## **1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience.

## **1.07 REGULATORY REQUIREMENTS**

- A. Construct ductwork to NFPA 90A and NFPA 90B [and NFPA 96] standards.

## **1.08 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

# **PART 2 - PRODUCTS**

## **2.01 MATERIALS**

- A. Galvanized Steel Ducts: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M FS Type B, with G90/Z275 coating. [Provide PVC-coated ducts for underground applications.]
- B. Steel Ducts: ASTM A 1008/A 1008M, Designation CS, cold-rolled commercial steel, or ASTM A 1011/A 1011M, Designation CS, hot-rolled steel.
- C. Aluminum Ducts: ASTM B 209 (ASTM B 209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength.
- D. Flexible Ducts:
  - 1. Manufacturers:
    - a. Flexmaster USA
  - 2. Two ply vinyl film supported by helically wound spring steel wire.
    - a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
    - b. Maximum Velocity: 4000 fpm.

- c. Temperature Range: -10 degrees F to 160 degrees F.

E. Insulated Flexible Ducts:

- 1. Manufacturers:
  - a. Flexmaster USA
- 2. Two ply vinyl film supported by helically wound spring steel wire; fiberglass insulation; polyethylene or aluminized vapor barrier film.
  - a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
  - b. Maximum Velocity: 4000 fpm.
  - c. Temperature Range: -10 degrees F to 160 degrees F.

## 2.02 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
- E. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.
- F. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.
- G. Fittings shall be of same material and thickness as the duct.



- H. Remove stick-on labels from exposed ductwork. Prime exposed ductwork for finish painting.
- I. Review the work of other trades, and provide necessary bends, offsets, duct enlargements and stream-lined pipe and hanger casings to eliminate conflicts.
- J. Duct sizes shown on plans are net interior dimensions. Adjust sheet metal size to account for interior duct lining.

## **2.03 DUCT MANUFACTURERS**

- A. Metal-Fab, Inc.
- B. SEMCO Incorporated
- C. United McGill Corporation
- D. Kirk & Blum

## **2.04 MANUFACTURED METAL DUCTWORK AND FITTINGS**

- A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Flat Oval Ducts: Machine made from round spiral lockseam duct with light reinforcing corrugations; fittings manufactured of at least two gages heavier metal than duct.
  - 1. Manufacturers:
    - a. United McGill Corporation
- C. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- C. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

- D. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- F. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- G. Use double nuts and lock washers on threaded rod supports.
- H. Tape joints of PVC coated metal ductwork with PVC tape.
- I. Connect terminal units to supply ducts with 1 foot maximum length of flexible duct. Do not use flexible duct to change direction.
- J. Connect diffusers or light troffer boots to low pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp.
- K. Connect flexible ducts to metal ducts with liquid adhesive plus tape; draw bands; or adhesive plus sheet metal screws.
- L. Use stainless steel with 2B finish for ductwork exposed to view and stainless steel with 2D finish for ducts where concealed.
- M. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

### **3.02 CLEANING**

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.
- B. Clean duct systems with high power vacuum machines. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

### **3.03 SCHEDULES**

- A. Ductwork Material:

1. Low Pressure Supply (Heating Systems): Steel, Aluminum.
2. Low Pressure Supply (System with Cooling Coils): Steel, Aluminum.
3. Return and Relief: Steel, Aluminum.
4. General Exhaust: Steel, stainless steel.

B. Ductwork Pressure Class:

1. Supply - 2 inches, minimum in main; 1 inch downstream of terminal unit.
2. Return and relief - 1 inch, minimum.
3. General exhaust - 1 inch, minimum.

**END OF SECTION 233100**

## **SECTION 233300 - AIR DUCT ACCESSORIES**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Air turning devices/extractors.
- B. Duct access doors.
- C. Duct test holes.
- D. Flexible duct connections.
- E. Volume control dampers.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association.
- B. NFPA 92A - Standard on Smoke-Control Systems; National Fire Protection Association.
- C. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.
- D. UL 33 - Heat Responsive Links for Fire-Protection Service; Underwriters Laboratories Inc.
- E. UL 555 - Standard for Fire Dampers; Underwriters Laboratories Inc..
- F. UL 555S - Standard for Leakage Rated Dampers for Use in Smoke Control Systems; Underwriters Laboratories Inc.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide for shop fabricated assemblies, including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

- B. Shop Drawings: Indicate for shop fabricated assemblies, including volume control dampers, duct access doors, and duct test holes.
- C. Manufacturer's Installation Instructions: Provide instructions for fire dampers and combination fire and smoke dampers.

## **1.05 PROJECT RECORD DOCUMENTS**

- A. Record actual locations of access doors, test holes, and fire dampers and fire/smoke dampers.

## **1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc.; or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

## **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Protect dampers from damage to operating linkages and blades.

## **1.08 EXTRA MATERIALS**

- A. Provide two of each size and type of fusible link.

# **PART 2 - PRODUCTS**

## **2.01 AIR TURNING DEVICES/EXTRACTORS**

- A. Manufacturers:
  - 1. Krueger
  - 2. Ruskin Company
  - 3. Titus
- B. Multi-blade device with blades aligned in short dimension; steel or aluminum to suit duct construction; with individually adjustable blades, mounting straps.

- C. Multi-blade device with radius blades attached to pivoting frame and bracket, steel or aluminum construction, with push-pull operator strap, ceiling mounted rotary operator knob, or worm drive mechanism with removable key operator, as indicated.

## **2.02 DUCT ACCESS DOORS**

### **A. Manufacturers:**

- 1. Nailor Industries Inc.
- 2. Ruskin Company
- 3. SEMCO Incorporated
- 4. Durodyne

- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

- C. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.

- 1. Less Than 12 inches Square: Secure with sash locks.
- 2. Up to 18 inches Square: Provide two hinges and two sash locks.
- 3. Up to 24 x 48 inches: Three hinges and two compression latches with outside and inside handles.
- 4. Larger Sizes: Provide an additional hinge.

- D. Access doors with sheet metal screw fasteners are not acceptable.

## **2.03 DUCT TEST HOLES**

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

## **2.04 FLEXIBLE DUCT CONNECTIONS**

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Flexible Duct Connections: Fabric crimped into metal edging strip.
  - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz. per sq. yd. for general application indoors. Ductwork exposed to weather, fabric shall be Hypalon-coated woven fiberglass. For kitchen exhaust, fabric shall be neoprene-coated woven fiberglass.
    - a. Net Fabric Width: Approximately 2 inches wide.
  - 2. Metal: 3 inches wide thick galvanized steel.
- C. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs. per sq. ft., 10 dB attenuation in 10 to 10,000 Hz range.

## **2.05 VOLUME CONTROL DAMPERS**

- A. Manufacturers:
  - 1. Louvers & Dampers, Inc.
  - 2. Nailor Industries Inc.
  - 3. Ruskin Company
  - 4. Durodyne.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
- D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

F. Quadrants:

1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30 inches provide regulator at both ends.

**PART 3 - EXECUTION**

**3.01 PREPARATION**

- A. Verify that electric power is available and of the correct characteristics.

**3.02 INSTALLATION**

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- F. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- G. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum two duct widths from duct take-off.



- H. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

**END OF SECTION 233300**

## **SECTION 233600 - AIR TERMINAL UNITS**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Constant volume terminal units.
- B. Variable volume terminal units.
- C. Fan powered terminal units.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilation Systems; National Fire Protection Association.
- B. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.
- C. ARI 880 - Air Terminals; Air-Conditioning and Refrigeration Institute.
- D. ARI 885 - Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets; Air-Conditioning and Refrigeration Institute.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings which indicate air flow, static pressure, and NC designation. Include electrical characteristics and connection requirements.
- B. Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.
  - 1. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of 1 to 4 inch wg.
- C. Manufacturer's Installation Instructions: Indicate support and hanging details, and service clearances required.

- D. Project Record Documents: Record actual locations of units and controls components.
- E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant volume regulators.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

## **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.
- C. Test and rate air terminal sound levels in accordance with ARI 880.

## **1.06 WARRANTY**

- A. Provide manufacturer warranty for air terminal units, integral sound attenuators, integral heating coils, and integral controls.

## **1.07 EXTRA MATERIALS**

- A. Provide two additional electric motors of each size.

# **PART 2 - PRODUCTS**

## **2.01 MANUFACTURERS**

- A. Acceptable Manufacturers:
  - 1. Carnes Company HVAC
  - 2. Enviro-tec
  - 3. Carrier
  - 4. Nailor
  - 5. Price Industries

6. Krueger

7. Trane

## **2.02 MANUFACTURED UNITS**

- A. Ceiling mounted [variable air volume], [constant volume] or [fan powered] supply air control terminals for connection to single duct, central air systems, with [pneumatic variable volume controls], [electric variable volume controls], [system powered variable volume controls], [electronic variable volume controls], [pneumatic constant volume control], [mechanical constant volume control], or [system powered constant volume control], [electric heating coils], [hot water heating coils].
- B. Identify each terminal unit with clearly marked identification label and air flow indicator. Include unit nominal air flow, maximum factory set airflow, minimum factory set air flow, and coil type.

## **2.03 SINGLE DUCT VARIABLE VOLUME UNITS**

- A. Basic Assembly:
  - 1. Casings: Minimum 22 gage galvanized steel.
  - 2. Lining: Minimum 1/2 inch thick neoprene or vinyl coated fibrous glass insulation, 1.5 lb./cu ft. density, meeting NFPA 90A requirements and UL 181 erosion requirements. Face lining with mylar film, Face lining with tedlar film.
  - 3. Plenum Air Inlets: Round stub connections for duct attachment.
  - 4. Plenum Air Outlets: S slip and drive connections.
- B. Basic Unit:
  - 1. Configuration: Air volume damper assembly inside unit casing. Locate control components inside protective metal shroud.
  - 2. Volume Damper: Construct of galvanized steel with peripheral gasket and self lubricating bearings; maximum damper leakage: 2 percent of design air flow at 1 inch inlet static pressure.
  - 3. Mount damper operator to position damper as indicated.
- C. Attenuator Section: Line attenuator sections with 2 inch thick insulation.

- D. Multi Outlet Attenuator Section: With 6 inch or 8 inch diameter collars, each with butterfly balancing damper with lock.
- E. Round Outlet: Discharge collar matching inlet size.
- F. Hot Water Heating Coil:
  - 1. Construction: 1/2 inch copper tube mechanically expanded into aluminum plate fins, leak tested under water to 200 psig pressure, factory installed.
  - 2. Capacity: As scheduled on the drawings.

## **2.04 FAN POWERED VARIABLE VOLUME UNITS**

- A. Basic Assembly:
  - 1. Casings: Minimum 22 gage galvanized steel.
  - 2. Lining: Minimum 1/2 inch thick neoprene or vinyl coated fibrous glass insulation, 1.5 lb./cu ft. density, meeting NFPA 90A requirements and UL 181 erosion requirements. Face lining with mylar film, Face lining with tedlar film.
  - 3. Plenum Air Inlets: Round stub connections and S slip and drive connections for duct attachment.
  - 4. Plenum Air Outlets: S slip and drive connections.
- B. Basic Unit:
  - 1. Configuration: Air volume damper assembly and fan in series or parallel arrangement inside unit casing. Locate control components inside protective metal shroud.
  - 2. Volume Damper: Construct of galvanized steel with peripheral gasket and self lubricating bearings; maximum damper leakage: 2 percent of design air flow at 1 inch rated inlet static pressure.
  - 3. Mount damper operator to position damper normally open.
- C. Automatic Damper Operator:
  - 1. Electric Actuator: 24 volt with [high limit], or [with remote temperature read and reset capability].
- D. Pneumatic Damper Operator: [8-13 psig] [3-13 psig] spring range.

1. Maximum Volume Controller and Probe: Pneumatic, with calibration pressure taps for high flow limited proportional variable air volume control.
- E. Velocity Reset Controller and Probe:
  1. Pneumatic:
    - a. Calibration pressure taps for pressure independent control to compensate for varying inlet static pressure.
    - b. Minimum and maximum limits set at reset device.
    - c. Maintain air flow to within 5 percent of set point with inlet static pressure variations up to 2 inches.
    - d. Reset span, fixed at 5 psi shall remain constant regardless of minimum or maximum setting. Reset start point shall be adjustable from 3-10 psi.
    - e. Reset span, adjustable 3 to 8 psi shall remain constant regardless of minimum or maximum setting. Reset start point shall be adjustable from 3-10 psi.
- F. Fan Assembly:
  1. Fan: Forward curved centrifugal type with direct drive permanent split capacitor type, thermally protected motor.
  2. Speed Control: Infinitely adjustable with electric/pneumatic and electronic controls.
  3. Isolation: Fan/motor assembly on rubber isolators.
  4. Electrical Characteristics: As scheduled on the drawings.
- G. Attenuator Section: Line attenuator sections with 2 inch thick insulation.
- H. Hot Water Heating Coil:
  1. Construction: 1/2 inch copper tube mechanically expanded into aluminum plate fins, leak tested under water to 200 psig pressure, factory installed.
- I. Wiring:
  1. Factory mount and wire controls. Mount electrical components in control box with removable cover. Incorporate single point electrical connection to power source.

2. Factory mount transformer for control voltage on electric and electronic control units. Provide terminal strip in control box for field wiring of thermostat and power source.
3. Electrical Characteristics:
  - a. As scheduled on the drawings.
4. Wiring Terminations: Wire fan and controls to terminal strip. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
5. Disconnect Switch: Factory mount [fused] [unfused] disconnect switch [in control panel] [on equipment].

J. Controls:

1. [Pneumatic], [Electric] or [Electronic] Controls: Contain in NEMA-1 enclosure with access panel sealed from air flow and mounted on side of unit. Factory mount controls [and thermostat] to accomplish the following specified sequence of operation.
2. Electronic Control, Central System Fan "On" - Occupied Mode:
  - a. When duct pressure is sensed indicating primary air system operating, thermostat and primary variable volume damper proportions air flow from central system.
  - b. As thermostat senses reduced cooling demand, volume damper closes. At field adjustable point, unit fan is energized. As cooling demand continues to fall, volume damper closes and fan speed increases.
  - c. If central duct system pressure varies, volume damper maintains constant primary air flow.
  - d. As thermostat senses no cooling requirement, control system closes volume damper. Before heating is initiated, control enters field adjustable no load band. On sensing need for heat, heating coil is energized proportionally or in steps.
3. Electronic Control, Central System Fan "Off" - Unoccupied Mode:
  - a. Provide field adjustable temperature setback. On need for heat, terminal unit fan and heating coil are energized.
  - b. Hold volume damper closed.
4. Pneumatic/Electric Control, Central System Fan "On" -Occupied Mode:

- a. As thermostat senses cooling, volume damper proportions air flow from central system.
  - b. As thermostat senses less cooling and damper closes, pneumatic/electric or damper position switch energizes fan.
  - c. Electronic fan speed control manually adjusts maximum fan speed to match downstream resistance.
  - d. Velocity reset primary air control (pressure independent) with maximum and minimum limits.
  - e. Hi-limit device, factory set, limits maximum primary air flow.
  - f. As thermostat senses no cooling, control system closes volume damper to stop flow from central system primary air duct before heating is initiated. On sensing further need for heat, heating coil is energized.
5. Pneumatic/Electric Control, Central System Fan "Off" - Unoccupied Mode:
- a. Thermostat cycles fan.
  - b. Day/night thermostat cycles fan and controls at reduced temperature.
- L. Thermostat: [Wall mounted pneumatic], [Wall mounted electric], or [Electronic] type with appropriate mounting hardware.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide ceiling access doors or locate units above easily removable ceiling components.
- C. Support units individually from structure. Do not support from adjacent ductwork.
- D. Connect to ductwork.
- E. Verify that electric power is available and of the correct characteristics.



**3.02 ADJUSTING**

- A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to 0 percent full flow.

**END OF SECTION 233600**

## **SECTION 233700 - AIR OUTLETS AND INLETS**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Diffusers.
- B. Registers/grilles.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.
- B. ARI 890 - Standard for Air Diffusers and Air Diffuser Assemblies; Air-Conditioning and Refrigeration Institute.
- C. ASHRAE Std 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.
- D. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level. Submit color chart.
- B. Samples: Submit one of each required air outlet and inlet type.
- C. Project Record Documents: Record actual locations of air outlets and inlets.

#### **1.05 QUALITY ASSURANCE**

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.

## **1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Krueger
- B. Price Industries
- C. Titus
- D. Tuttle and Bailey

### **2.02 RECTANGULAR CEILING DIFFUSERS**

- A. Type: Square and rectangular, adjustable pattern, multi-louvered diffuser to discharge air in pattern indicated on the drawings.
- B. Frame: Inverted T-bar. In plaster ceilings, provide plaster frame and ceiling frame.
- C. Fabrication: Steel with baked enamel finish.
- D. Accessories: [Radial opposed blade], [butterfly] or [combination splitter] damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

### **2.03 PERFORATED FACE CEILING DIFFUSERS**

- A. Type: Perforated face with fully adjustable pattern and removable face.
- B. Frame: Inverted T-bar. In plaster ceilings, provide plaster frame and ceiling frame.
- C. Fabrication: Steel with steel frame and baked enamel finish.
- D. Accessories: [Radial opposed blade], [butterfly], or [combination splitter] damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

### **2.04 CEILING EXHAUST AND RETURN REGISTERS/GRILLES**

- A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical or horizontal face.

- B. Frame: 1-1/4 inch margin with [countersunk screw] or [concealed] mounting.
- C. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory finish, color to be selected.
- D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

## **2.05 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES**

- A. Type: Fixed grilles of 1/2 x 1/2 x 1/2 inch (13 x 13 x 13) louvers.
- B. Fabrication: [Polystyrene] or [acrylic] plastic with off-white finish.
- C. Fabrication: Aluminum with factory clear lacquer finish.
- D. Frame: Channel lay-in frame for suspended grid ceilings.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black.

**END OF SECTION 233700**

## **SECTION 260519 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Wire and cable for system voltage of 600 volts and less.
- B. Wiring connectors and connections.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- B. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide for each cable assembly type.
- B. Test Reports: Indicate procedures and values obtained.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency.
- D. Project Record Documents: Record actual locations of components and circuits.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

- C. Products: Furnish products listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

## **PART 2 - PRODUCTS**

### **2.01 WIRING REQUIREMENTS**

- A. Exposed Dry Interior Locations: Use only building wire in raceway.
- B. Above Accessible Ceilings and in Drywall: Use only building wire in raceway, armored cable, or metal clad cable. Use of armored cable and metal clad cable is limited to branch circuits not exceeding 30 amp.
- C. Wet or Damp Interior Locations: Use only building wire in raceway.
- D. Exterior Locations: Use only building wire in raceway or service-entrance cable.
- E. Underground Installations: Use only building wire in raceway, direct burial cable, or service-entrance cable.
- F. Use solid conductor for feeders and branch circuits 10 AWG and smaller.
- G. Use stranded conductors for control circuits.
- H. Use conductor not smaller than 12 AWG for power and lighting circuits.
- I. Use conductor not smaller than 14 AWG for control circuits.
- J. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.
- K. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.
- L. Conductor sizes are based on copper unless indicated as aluminum or "AL".
- M. Variable Frequency Drive: Use only diesel locomotive cable DLO in raceway between power output of variable frequency drive and 460 volt motor.

### **2.02 WIRE MANUFACTURERS**

- A. Cerro Wire & Cable Company.
- B. Industrial Wire & Cable, Inc.
- C. Southwire Company.

## **2.03 BUILDING WIRE**

- A. Description: NFPA 70, Type THHN/THWN; Type XHHW, single conductor insulated wire.
- B. Conductor: Copper.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation: Thermoplastic, Thermosetting Compound.
- E. Insulation Temperature Rating: 75 degrees for wet or damp locations, and 90 degrees for dry locations.

## **2.04 WIRING CONNECTORS**

- A. Provide the following types of connectors:
  - 1. Split Bolt Connectors
  - 2. Solderless Pressure Connectors
  - 3. Spring Wire Connectors
  - 4. Compression Connectors

## **2.05 CONDUCTOR INSULATION COLOR CODE**

- A. For convenience in testing and maintenance, all secondary conductors shall be color coded in accordance with the established building standard, or if no standard exists, in accordance with the following schedule:
  - 1. 208/120 Volt Systems:
    - a. Phase A - Black
    - b. Phase B - Red
    - c. Phase C - Blue
    - d. Neutral - White
    - e. Ground - Green

2. 480/277 Volt Systems:
  - a. Phase A - Brown
  - b. Phase B - Orange
  - c. Phase C - Yellow
  - d. Neutral - White with Stripe
  - e. Ground - Green
3. Control circuit wiring shall have separate identifying colors or numbers.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that interior of building has been protected from weather.
- B. Verify that mechanical work likely to damage wire and cable has been completed.
- C. Verify that raceway installation is complete and supported.
- D. Verify that field measurements are as indicated.

#### **3.02 PREPARATION**

- A. Completely and thoroughly swab raceway before installing wire.

#### **3.03 INSTALLATION**

- A. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Route wire and cable as required to meet project conditions.
  1. Wire and cable routing indicated is approximate unless dimensioned.
  2. Where wire and cable destination is indicated and routing is not shown, determine exact routing.
  3. Include wire and cable of lengths required to install connected devices within 10 ft. of location shown.



- C. Use wiring methods indicated.
- D. Pull all conductors into raceway at the same time.
- E. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- F. Protect exposed cable from damage.
- G. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.
- H. Use suitable cable fittings and connectors.
- I. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- J. Clean conductor surfaces before installing lugs and connectors.
- K. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- L. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
- M. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
- N. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
- O. Provide a separate green insulated ground wire in each feeder and branch circuit and other conduits containing current carrying conductors.
- P. Unless specifically indicated otherwise, each single phase branch circuit shall consist of respective phase conductor and a dedicated neutral conductor.
- Q. Identify and color code wire and cable. Identify each conductor with its circuit number or other designation indicated.
- R. Trench and backfill for direct burial cable installation. Install warning tape along entire length of direct burial cable, within 3 inches of grade.
- S. Connectors and terminals for conductors more finely stranded than Class B and Class C stranding shall be identified for the specific class.

### **3.04 FIELD QUALITY CONTROL**

- A. Perform field inspection and testing.
- B. Perform inspections and tests listed in NETA STD ATS, Section 7.3.2.

**END OF SECTION 260519**

## **SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Grounding and bonding components.
- B. Provide all components necessary to complete the grounding system consisting of:
  - 1. Equipment ground (personnel safety ground).

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association.
- C. NFPA 99 - Standard for Health Care Facilities; National Fire Protection Association.

#### **1.04 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience with service facilities within 100 miles of Project.
- C. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

### **PART 2 - PRODUCTS**

#### **2.01 COMPONENTS**

- A. Conductors:

1. Equipment Ground Conductors: Insulated (600V grade), solid or stranded copper conductor. Size shall meet NFPA 70 requirements.

## **2.02 CONNECTORS AND ACCESSORIES**

- A. Mechanical Connectors: Bronze.
- B. Exothermic Connections:
  1. Product: As manufactured by Cadweld or Thermalweld.
- C. Wire: Stranded copper.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions prior to beginning work.

### **3.02 INSTALLATION**

- A. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- B. Cable supports for grounding conductors shall be such that they do not form a continuous metallic ring around the conductor.

### **3.03 FIELD QUALITY CONTROL**

- A. Provide field inspection.
- B. Perform inspections and tests listed in NETA STD ATS, Section 7.13.

**END OF SECTION 260526**

## **SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Conduit, boxes and equipment supports.
- B. Hangers and supports.
- C. Anchors and fasteners.
- D. Sleeves and seals.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide manufacturer's catalog data for fastening systems.
- B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Thomas & Betts Corporation.
- B. Threaded Rod Company.

### **2.02 MATERIALS**

- A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.
- B. Supports: Fabricated of structural steel or formed steel members; galvanized.
- C. Anchors and Fasteners:
  - 1. Do not use powder-actuated anchors, spring clips, or beam clamps.
  - 2. Concrete Structural Elements: Use precast inserts, expansion anchors, powder-actuated anchors, or preset inserts.
  - 3. Steel Structural Elements: Use beam clamps, steel spring clips, steel ramset fasteners, or welded fasteners.
  - 4. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
  - 5. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
  - 6. Solid Masonry Walls: Use expansion anchors or preset inserts.
  - 7. Sheet Metal: Use sheet metal screws.
  - 8. Wood Elements: Use wood screws.
  - 9. Provide steel anchors of types, sizes and materials required for the equipment being supported.
- D. Provide supporting devices which comply with manufacturer's standard materials, design and construction in accordance with published product information and as required for complete installation, and as herein specified. Where more than one type of supporting device meets indicated requirements, selection is installer's option.

- E. Provide supporting devices of types, sizes and materials indicated, having the following construction features:
1. Clevis hangers shall be used for supporting 2 inch and larger conduit, and shall be constructed of galvanized steel with 1/2 inch diameter hole for round steel rod.
  2. One-hole conduit straps shall be used for supporting 3/4 inch to 1-1/2 inch conduit and shall be constructed of galvanized steel.
  3. Two-hole conduit straps shall be used for supporting conduit on steel racks.
- F. Provide U-channel strut system for supporting electrical equipment, 12 gauge hot-dip galvanized steel, of types and sizes indicated, and with the following fittings which mate and match with U-channel:
1. Thin wall conduit clamps
  2. Rigid conduit clamps
  3. Conduit hangers
- G. Provide sleeves and seals of types, sizes and materials indicated with the following construction features:
1. Provide factory assembled watertight wall and floor seals of types and sizes indicated, suitable for sealing around conduit, pipe or tubing passing through concrete floors and walls. Construct seals with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps and cap screws.
- H. Provide pipe sleeves of one of the following:
1. Fabricate from galvanized sheet metal, round tube closed with snaplock joint, welded spiral seams or welded longitudinal joint. Fabricate sleeves from the following gauge metal: 3 inch and smaller - 20 gauge, 4 inch to 6 inch - 20 gauge, over 6 inch - 14 gauge.
  2. Fabricate from Schedule 40 galvanized steel pipe. Remove burrs.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.

1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
  2. Do not drill or cut structural members.
  3. Obtain permission from Architect before drilling or cutting structural members.
  4. Install supports with spacings indicated and in compliance with NEC requirements.
- B. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- C. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- D. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.
- E. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
- F. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with spacings indicated and in compliance with NEC requirements.
- G. No minerallac "Jiffy" type conduit supports shall be installed exposed below 8'-0" AFF. Use one-hole straps instead.

**END OF SECTION 260529**



## **SECTION 260534 - CONDUITS**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Conduit, fittings and conduit bodies.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC).
- B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT).
- C. ANSI C80.5 - American National Standard for Electrical Rigid Aluminum Conduit (ERAC).
- D. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- E. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT); National Electrical Contractors Association.
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association.
- G. NFPA 70 - National Electrical Code; National Fire Protection Association.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, nonmetallic conduit, fittings, and conduit bodies.
- B. Project Record Documents: Accurately record actual routing of conduits larger than 1-1/4 inches.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

## **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Accept conduit on site. Inspect for damage.
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- C. Protect PVC conduit from sunlight.

## **PART 2 - PRODUCTS**

### **2.01 CONDUIT REQUIREMENTS**

- A. Conduit Size: Comply with NFPA 70.
  - 1. Minimum Size: 3/4 inch, unless otherwise specified or noted on the drawings.
- B. Install all wire and cables in electrical metallic tubing, unless otherwise specified or indicated on the drawings.
  - 1. Flexible metallic conduit (min. 1/2 inch trade size) shall be used for connection from a junction box to lighting fixtures, motors and other similar equipment mounted in a suspended ceiling, as well as for connection to transformers.
  - 2. Liquid-tight flexible metallic conduit shall be used for connection to motors and other equipment which produces or transmits vibration or noise, unless the motors or equipment are mounted above suspended ceiling. Provide suitable bonding jumper for all connections.

### **2.02 ELECTRICAL METALLIC TUBING (EMT)**

- A. Manufacturers:
  - 1. Allied Tube & Conduit.
  - 2. Beck Manufacturing, Inc.
  - 3. Wheatland Tube Company.

- B. Description: ANSI C80.3; galvanized tubing.
- C. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type up to 1-1/4 inch EMT, and set screw type 1-1/2 inch and larger EMT.

## **2.03 FLEXIBLE METAL CONDUIT**

- A. Manufacturers:
  - 1. AFC Cable Systems, Inc.
  - 2. Electri-Flex Company.
  - 3. International Metal Hose.
- B. Description: Interlocked zinc coated steel construction.
- C. Fittings: NEMA FB 1.

## **2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT**

- A. Manufacturers:
  - 1. AFC Cable Systems, Inc.
  - 2. Electri-Flex Company.
  - 3. International Metal Hose.
- B. Description: Interlocked steel construction, galvanized inside and outside, with PVC jacket.
- C. Fittings: NEMA FB 1.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as shown on drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

### **3.02 INSTALLATION**

- A. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install steel conduit as specified in NECA 101.
- C. Install nonmetallic conduit in accordance with manufacturer's instructions.
- D. Arrange supports to prevent misalignment during wiring installation.
- E. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- F. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- G. Fasten conduit supports to building structure and surfaces.
- H. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- I. Do not attach conduit to ceiling support wires.
- J. Arrange conduit to maintain headroom and present neat appearance.
- K. Route exposed conduit parallel and perpendicular to walls.
- L. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- M. Route conduit in and under slab from point-to-point.
- N. Do not cross conduits in slab.
- O. Maintain adequate clearance between conduit and piping.
- P. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
- Q. Cut conduit square using saw or pipecutter; de-burr cut ends.
- R. Bring conduit to shoulder of fittings; fasten securely.

- S. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- T. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations.
- U. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate bends in metal conduit larger than 2 inch size.
- V. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- W. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic.
- X. Provide suitable pull string in each empty conduit except sleeves and nipples.
- Y. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- Z. Ground and bond conduit.
- AA. Identify conduit.

### **3.03 INTERFACE WITH OTHER PRODUCTS**

- A. Install conduit to preserve fire resistance rating of partitions and other elements.
- B. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation.

**END OF SECTION 260534**

## **SECTION 260537 - BOXES**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- B. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association.
- C. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association.
- D. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; National Electrical Manufacturers Association.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association.
- F. NFPA 70 - National Electrical Code; National Fire Protection Association.

#### **1.04 SUBMITTALS**

- A. Project Record Documents: Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

- B. Products: Provide products listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Appleton Electric.
- B. Arc-Co./Division of Arcade Technology.
- C. Unity Manufacturing.

### **2.02 OUTLET BOXES**

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
  - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
  - 2. Provide box supports, mounting ears and brackets, wallboard hangers, box extension rings, cable clamps and metal straps as required for individual wiring situations.

### **2.03 PULL AND JUNCTION BOXES**

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. The boxes shall be of riveted or welded construction, and shall have plain machine screw attached covers.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify locations of floor boxes and outlets in offices and work areas prior to rough-in.

### **3.02 INSTALLATION**

- A. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.
- C. Coordinate installation of outlet boxes for equipment connected.

- D. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- E. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
  - 1. Adjust box locations up to 10 feet if required to accommodate intended purpose.
- F. Orient boxes to accommodate wiring device orientation.
- G. Maintain headroom and present neat mechanical appearance.
- H. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- I. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- J. Install boxes to preserve fire resistance rating of partitions and other elements.
- K. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- L. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- M. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- N. Use flush mounting outlet box in finished areas.
- O. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- P. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.
- Q. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- R. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- S. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- T. Use adjustable steel channel fasteners for hung ceiling outlet box.
- U. Do not fasten boxes to ceiling support wires.
- V. Support boxes independently of conduit.



- W. Use gang box where more than one device is mounted together. Do not use sectional box.
- X. Use gang box with plaster ring for single device outlets.
- Y. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- Z. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.
- AA. Pull boxes shall be installed approximately 100 feet apart in all feeder conduit runs and as required to overcome physical obstruction of the installation.
- AB. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.
- AC. Adjust flush-mounting outlets to make front flush with finished wall material.
- AD. Install corrosion-resistant knockout closures in unused box openings.
- AE. Install knockout closures in unused box openings.

### **3.03 CLEANING**

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

**END OF SECTION 260537**

## **SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.
- D. Field-painted identification of conduit.
- E. Electrical boxes.
- F. Wallplates.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. NFPA 70 - National Electrical Code; National Fire Protection Association.

#### **1.04 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

### **PART 2 - PRODUCTS**

#### **2.01 NAMEPLATES**

- A. Nameplates: Engraved three-layer laminated plastic with beveled edges, black letters on white background.
- B. Locations:
  - 1. Each electrical distribution and control equipment enclosure.
  - 2. Each feeder circuit breaker in power distribution panelboard and switchboard.

C. Letter Size:

1. Use 1/8 inch letters for identifying individual panelboards, motor controllers, VFDs, UPS, switches and similar electrical enclosures.

- D. The nameplates shall indicate the equipment identification number, voltage and source panel feeder or branch circuit numbers (e.g. PANEL LP-1, 480/277 VOLTS FED FROM DP-1, FDR 1-5).

## **2.02 WIRE MARKERS**

- A. Description: Self-adhering vinyl labels or tape.

- B. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, junction boxes, and wireways.

C. Legend:

1. Power and Lighting Circuits: Feeder conductors shall be identified with source panel name and feeder number, voltage and conductor size (e.g. DP-1, FDR 1-5, 208/120 VOLTS, 4 No. 250 kCMIL).
2. Branch circuits shall be identified with source panel and circuit number (e.g. PNL RP-5, CIRC. 3).
3. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings or shop drawings.

## **2.03 CONDUIT MARKERS**

- A. Description: Pre-printed flexible plastic sheet material or self-adhering vinyl labels.

- B. Location: Furnish markers for each conduit longer than 6 feet.

- C. Spacing: 50 feet in each room, and 50 feet on center in open areas.

D. Color:

1. Fire Alarm System: Painted Red.
2. Conduits containing conductors of voltage greater than 600V: Painted Red.

E. Legend:

1. Each feeder conduit shall be identified with source panel name and feeder number and voltage (e.g. DP-1, FDR 1-5 - 208/120 VOLTS).

**2.04 ELECTRICAL BOXES (JUNCTION AND PULL BOXES AND OUTLET BOXES)**

- A. Covers of electrical boxes shall be identified with "felt tip magic markers" as to the source panelboard, circuit number and voltage which they contain. Identification shall be on the outside for junction and pull boxes, and inside for outlet boxes.

**2.05 WALLPLATES**

- A. Wallplates of all receptacles shall be [engraved] or [labeled with Brother P-Touch laminated adhesive labels, or Kroy equivalent,] with panelboard name and circuit number serving them (e.g. PNL RP-5, CIRC. 30).
- B. Wallplates of emergency receptacles shall be painted red.

**2.06 IDENTIFICATION BY COLOR**

- A. Wires and wiring devices shall be color coded.

**2.07 WARNING SIGNS**

- A. Provide all warning signs required by NFPA 70 and other applicable codes.

**PART 3 - EXECUTION**

**3.01 PREPARATION**

- A. Degrease and clean surfaces to receive nameplates and labels.

**3.02 INSTALLATION**

- A. Install nameplates and labels parallel to equipment lines.
- B. Secure nameplates to equipment front using screws, rivets or adhesive.
- C. Secure nameplates to inside surface of door on panelboard that is recessed in finished locations.
- D. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches below finished grade.

**END OF SECTION 260553**

## **SECTION 260943.13 - DISTRIBUTED DIGITAL LIGHTING CONTROL SYSTEM**

### **PART 1- GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Distributed Digital Lighting Control System: System includes
  - 1. Digital Lighting Controls
  - 2. Emergency Lighting Control.

#### **1.02 RELATED SECTIONS**

- A. Section 26 5100 - Interior Lighting.

#### **1.03 REFERENCES**

- A. NFPA 70 - National Electrical Code; National Fire Protection Association.
- B. NEMA - National Electrical Manufacturers Association
- C. FCC emission standards
- D. UL - Underwriters Laboratories, Inc. Listings
- E. UL 2043 - Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products Installed in Air-Handling Spaces.
- F. UL 924 - Standard for Emergency Lighting and Power Equipment

#### **1.04 DESIGN/PERFORMANCE REQUIREMENTS**

- A. Digital Lighting Management System shall accommodate the square-footage coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, switches, daylighting sensors and accessories that suit the required lighting and electrical system parameters.
- B. System shall conform to requirements of NFPA 70.
- C. System shall comply with FCC emission standards specified in part 15, sub-part J for commercial and residential application.

- D. System shall be listed under UL sections 916 and/or 508.
- E. System shall comply with the energy code, adopted by the jurisdiction for the project.

## **1.05 SUBMITTALS**

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Catalog sheets and specifications.
  - 2. Ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
- B. Shop Drawings: Wiring diagrams for the various components of the System specified including:
  - 1. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed.
  - 2. Show location of all devices, including at minimum sensors, load controllers, and switches/dimmers for each area on reflected ceiling plans.
  - 3. Provide room/area details including products and sequence of operation for each room or area. Illustrate typical acceptable room/area connection topologies.
- C. Closeout Submittals:
  - 1. Project Record Documents: Record actual installed locations and settings for lighting control devices.
  - 2. Operation and Maintenance Manual:
    - a. Include approved Shop Drawings and Product Data.
    - b. Include Sequence of Operation, identifying operation for each room or space.
    - c. Include manufacturer's maintenance information.
    - d. Operation and Maintenance Data: Include detailed information on device programming and setup.
    - e. Include startup and test reports.

## **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation

## **1.07 PROJECT CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
  - 1. Ambient temperature: 32 to 104 degrees F (0 to 40 degrees C).
  - 2. Relative humidity: Maximum 90 percent, non-condensing.

## **1.08 WARRANTY**

- A. The lighting control manufacturer shall warrant the system to be free from manufacturing defects for a period of five years from shipment.
- B. The warranty shall include replacement parts deemed necessary to restore the system to normal operation.
- C. The manufacturer shall provide telephone technical support and remote diagnostics where applicable during normal business hours, excluding manufacturer holidays.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Acceptable Manufacturer: Crestron, Hubbell, Leviton, nLight (Acuity Brands) and Wattstopper (Legrand).
- B. Substitutions: Make request for approval at least 5 working days prior to bid date.
- C. Basis of Design: nLight.
- D. Due to the differences in product design among manufacturers, the specifications and drawings are intended to convey the design intent using the basis of design as an illustration. Products by any other manufacturer may require different quantity, location, wiring topology, wiring type and

accessories. The price shall include all such considerations for a complete system to meet the performance expectation of the design intent.

## **2.02 DISTRIBUTED DIGITAL LIGHTING CONTROL SYSTEM**

- A. System General: Provide Distributed Lighting Management System (DLM) complete with all necessary enclosures, wiring, and system components to ensure a complete and properly functioning system as indicated on the Drawings and specified herein. If a conflict is identified, between the Drawing and this Specification, contact the Architect for clarification prior to proceeding.
- B. Equipment Required: Lighting Control system as defined under this section covers the following equipment.
  - 1. Digital Lighting Management (DLM) local network: Free topology, plug-in wiring system (Cat 5e or higher) for power and data to room devices.
  - 2. Digital Room Controllers: Digitally addressable one, two or three relay plenum-rated controllers for on/off control. Dimming models include 0-10 volt dimming capability.
  - 3. Digital Occupancy Sensors: Digitally addressable, calibrated occupancy sensors.
  - 4. Digital Switches: Digitally addressable pushbutton on/off, dimming, and scene switches.
  - 5. Digital Daylighting Sensors: Open loop daylighting sensors for daylight harvesting using switching, bi-level, tri-level or dimming control.
  - 6. Configuration Tools: Handheld remote for room configuration and relay panel programming provides two way infrared (IR) or wireless communications to digital devices and allows complete configuration and reconfiguration of the device/room.
  - 7. Emergency Lighting Control Unit (ELCU): Allows a standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building.

## **2.03 DIGITAL LOAD CONTROLLERS**

- A. Digital Room Controllers: Provide controllers to control the quantity of lighting and plug loads required.
  - 1. Room controllers shall integrate the functionality of connected control components including wall switch/dimming stations, occupancy sensors and daylight sensors to provide the required sequence of operation for the space.



2. Room controllers and associated room control components shall be capable of operating in a totally standalone mode and not require the use of a network, software, computer or server for local control functions.
3. Quick low voltage connections using standard RJ-45 connectors.
4. Each dimmable load shall be capable of individually configurable to the following behavior on power up following the loss of normal power:
  - a. Turn on to a pre-determined level
  - b. Turn off
  - c. Turn on to last level
5. Each non-dimmable load shall be capable of individually configurable to the following behavior on power up following the loss of normal power:
  - a. Turn on
  - b. Turn off
6. Each load be configurable to operate in the following sequences based on occupancy:
  - a. Auto-on/Auto-off
  - b. Manual-on/Auto-off
7. Polarity of each load output shall be reversible, via digital configuration, so that on is off and off is on.
8. UL 2043 plenum rated.
9. Manual override for each load.
10. Zero cross circuitry for each load.
11. All digital parameter data programmed into an individual room controller shall be retained in non-volatile memory within the controller itself. Memory shall have an expected life of no less than five years.
12. The room controller shall have a single power feed and shall be capable of operation at nominal voltages between 120 and 277 volts, 60 Hz.

13. The room controller shall be capable of supplying Class 2 auxiliary power for use by wall switch/dimming stations, occupancy sensors and daylight sensors connected to the room controller via RJ-45 connectors.
  14. Provide the following set up and configuration functions without the need for another device or software:
    - a. Assign relays for control by wall switch station buttons
    - b. Configure relays for auto-on or manual-on functions with detection of occupancy
    - c. Assign dimmers to raise/lower switches
    - d. Assign dimming channels or relays for response to daylight sensor control
    - e. Auto calibrate default daylight sensor sequence of operation
    - f. Save preset scenes
- B. On/Off Room Controllers shall have:
1. Rating for 20 A load at 120/277 V dual voltage.
  2. One or two relay configuration.
  3. Minimum three RJ-45 network ports.
- C. On/Off/0-10 V dimming room controllers shall have:
1. Rating for 20 A load at 120/277 V dual voltage.
  2. One or two relay configuration.
  3. Minimum three RJ-45 network ports.
  4. One dimming output per relay:
    - a. One 0-10 volt analog output per relay for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the room controller so that the controlled lighting will be at full light output
    - b. The controller shall completely switch off the controlled lighting when the dimming level reaches 0.

5. Fade rates for dimming loads shall be specific to bound switch buttons, and the load shall maintain a default value for any bound buttons that do not specify a unique value.
6. The following selectable dimming attributes
  - a. Establish preset level for each load from 0 – 100 percent
  - b. Set high and low trim for each load
- D. Where dimming technologies other than 0 -10V are required by the luminaire schedule on the drawings, provide devices to perform the dimming function. Such technologies include, but are not limited to, incandescent, MLV, ELV, LED and fluorescent, and should be forward or reverse phase as appropriate. The device can be a load controller capable of the required dimming function, or an additional component to convert the dimming output from 0 -10V controller. Provide all necessary accessories.

## **2.04 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR**

- A. Digital Occupancy Sensors shall include the following features:
  1. Digital calibration and pushbutton configuration for the following variables:
    - a. Sensitivity, 0-100 percent in 10 percent increments.
    - b. Time delay, 1-30 minutes in 1 minute increments; set at 20 minutes, unless otherwise noted on the drawings.
    - c. Test mode, Five second time delay.
    - d. Detection technology, PIR, Ultrasonic or Dual Technology activation and/or re-activation. Set to both technology to initiate occupancy and either technology to maintain occupancy, unless otherwise noted on the drawings.
    - e. Walk-through mode.
  2. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the local network.
  3. Programmable control functionality including:
    - a. Each sensor may be programmed to control specific loads within a local network.
    - b. Sensor shall be capable of activating one of 16 user-definable lighting scenes.

- c. Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically within a configurable period of time (default 10 seconds) after turning off.
  4. One or two RJ-45 ports for connection to DLM local network.
  5. Two-way infrared or wireless communication to allow remote programming through handheld commissioning tool and control by remote personal controls.
  6. Manual override of controlled loads.
  7. All digital parameter data programmed into an individual occupancy sensor shall be retained in non-volatile memory within the sensor itself. Memory shall have an expected life of no less than five years.
  8. Up to four occupancy sensors may be connected to one room controller. If more occupancy sensors are required to provide coverage, provide more room controllers and connect them via a local network.
- B. Multiple occupancy sensors may be installed in a room by simply connecting them to the local network.

## **2.05 DIGITAL WALL SWITCH OCCUPANCY SENSORS**

- A. Digital Occupancy Sensors shall include the following features:
1. Digital calibration and pushbutton configuration for the following variables:
    - a. Sensitivity: 0-100 percent in 10 percent increments.
    - b. Time delay: 1-30 minutes in 1 minute increments, set at 20 minutes, unless otherwise noted on the drawings.
    - c. Test mode: Five second time delay.
    - d. Detection technology: PIR, Dual Technology activation and/or re-activation set to both technology to initiate occupancy and either technology to maintain occupancy, unless otherwise noted on the drawings.
    - e. Walk-through mode.
  2. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the local network.

3. Programmable control functionality including:
    - a. Each sensor may be programmed to control specific loads within a local network.
    - b. Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically during the configurable period of time (default 10 seconds) after turning off.
  4. One or two RJ-45 ports for connection to DLM local network.
  5. Two-way infrared or wireless communication to allow remote programming through handheld configuration tool and control by remote personal controls.
  6. Manual override of controlled loads
  7. All digital parameter data programmed into an individual wall switch sensor shall be retained in non-volatile memory within the wall switch sensor itself. Memory shall have an expected life of no less than five years.
- B. Two-button wall switch occupancy sensors, when connected to a single relay dimming room controller, shall operate in the following sequence:
1. Left button
    - a. Press and release - Turn load on
    - b. Press and hold - Raise dimming load
  2. Right button
    - a. Press and release - Turn load off
    - b. Press and hold - Lower dimming load

## **2.06 DIGITAL WALL SWITCHES**

- A. Low voltage momentary pushbutton switches in 1, 2, 3, 4, and 5 button configuration on single gang box. Wall switches shall include the following features:
1. Two-way infrared or wireless communication for personal and configuration remote controls.
  2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons.

3. Scene patterns may be saved to any button other than dimming rockers. Once set, buttons may be digitally locked to prevent overwriting of the preset levels.
  4. All digital parameter data programmed into an individual wall switch shall be retained in non-volatile memory within the wall switch itself. Memory shall have an expected life of no less than five years.
- B. Two RJ-45 ports for connection to the local network.
- C. Multiple digital wall switches may be installed in a room by simply connecting them to the local network to achieve multi-way switching.
- E. Load and Scene button function may be reconfigured for individual buttons from Load to Scene, and vice versa.
1. Individual button function may be configured to Toggle, On only, Off only, Raise and Lower.
  2. Individual scenes may be locked to prevent unauthorized change.
  3. Fade Up and Fade Down times for individual scenes may be adjustable.
  4. Ramp rate may be adjusted for each dimmer switch.
  5. Switch buttons may be bound to any load on any load controller or relay panel and are not load type dependent; each button may be bound to multiple loads.

## **2.07 DIGITAL DAYLIGHTING SENSORS**

- A. Open loop digital photosensors shall include the following additional features:
1. An internal photodiode that measures light in a 60-degree angle (cutting off the unwanted light from the interior of the room).
  2. Automatically establishes application-specific setpoints following manual calibration using a wireless configuration tool or a PC with appropriate software. For switching operation, an adequate deadband between the ON and OFF setpoints for each zone shall prevent the lights from cycling; for dimming operation, a proportional control algorithm shall maintain the design lighting level in each zone.

## **2.08 EMERGENCY LIGHTING CONTROL DEVICES**

- A. Emergency Lighting Control Unit - A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal ON/OFF control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. If the lighting is on a dimming circuit, the emergency lighting shall be turned on to full brightness. Features include:
1. 120/277 volts, 50/60 Hz, 20 amp ballast rating.
  2. Push to test button.
  3. Auxiliary contact for remote test or fire alarm system interface.
  4. Contact for opening 0 -10V dimming circuit on loss of normal power.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install system in accordance with the approved system shop drawings and manufacturer's instructions.
- B. Install all room devices using manufacturer's factory-tested Cat. 5e (or higher rated as required) cable with pre-terminated RJ-45 connectors.
1. If pre-terminated cable is not used for room/area wiring, each field-terminated cable shall be tested following installation and testing results submitted to the Manufacturer's Representative for approval prior to proceeding with the Work.
  2. Install all room to room network devices using manufacturer-supplied network wire or wireless devices.
  3. Low voltage wiring topology must comply with manufacturer's specifications.
  4. Document final wiring location, routing and topology on as built drawings.
- C. Class 2 wiring shall not be installed in the same raceway as Class 1 conductors. Unless required by the manufacturer, Class 2 wiring need not be installed in raceway, but shall be plenum rated where installed in space used for environmental air.
- D. Test all devices to ensure proper communication.

- E. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings. Adjust time delay so that controlled area remains lighted while occupied.
- F. Provide written or computer-generated documentation on the configuration of the system including room by room description including:
  - 1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
  - 2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
  - 3. Load Parameters (e.g. blink warning, etc.)
- G. Post start-up tuning - Adjust sensor time delays and sensitivities to meet the Owner's requirements 30 days from beneficial occupancy. Provide a detailed report to the Architect/Owner of post start-up activity.
- H. Tighten all panel Class 1 conductors from both circuit breaker and to loads to torque ratings as marked on enclosure UL label.
- I. All Class 2 cabling shall enter enclosures from within low-voltage wiring areas and shall remain within those areas. No Class 1 conductors shall enter a low-voltage area.

### **3.02 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections: Manufacturer's service representative shall perform the following inspections and prepare reports.
  - 1. Verify Class 1 and 2 wiring connections are terminated properly.
  - 2. Verify/complete task programming for all switches, dimmers, time clocks, and sensors.
  - 3. Verify that the control of each space complies with the Sequence of Operation.
  - 4. Correct any system issues and retest.
- C. Provide a report in table format with drawings, or using a software file that can be opened in the manufacturer's system software including each room or space that has lighting control installed. Indicate the following:



1. Date of test or inspection.
2. Loads per space, or Fixture Address identification.
3. Quantity and Type of each device installed
4. Reports providing each device's settings.

### **3.03 DEMONSTRATION AND TRAINING**

- A. Before Substantial Completion, arrange and provide a one-day Owner instruction period to designated Owner personnel. Set-up, starting of the lighting control system and Owner instruction includes:
  1. Demonstration of entire system operation and communication to each device.
  2. Demonstration of operation of individual relays, switches, and sensors.
  3. Confirmation of system Programming, photocell settings, override settings, etc.
  4. Provide training to cover installation, programming, operation, and troubleshooting of the lighting control system.
- B. The Owner shall have the option of video recording the demonstration and training.

### **3.04 FUNCTIONAL TESTING OF LIGHTING CONTROLS**

- A. The lighting control shall be tested for proper function. Documentation shall be prepared by a registered professional engineer and provided to the Owner within 90 days of the date of receipt of the Certificate of Occupancy. As a minimum, the documentation shall include:
  1. Drawings that show the location and catalog number of each piece of lighting control equipment.
  2. An operating and maintenance manual that includes:
    - a. Name and address of not less than one service agency for installed equipment.
    - b. A narrative of how each system is intended to operate, including recommended setpoints.
    - c. Submittal data indicating all selected options for each piece of lighting equipment and lighting controls.

- d. Operation and maintenance manuals for each piece of lighting equipment. Required routine maintenance actions and cleaning shall be clearly identified.
  - e. A schedule for inspecting and recalibrating all lighting controls.
- 3. A report of test results, including the following:
  - a. Results of functional performance tests.
  - b. Disposition of deficiencies found during testing, including details of corrective measures used or proposed.

**END OF SECTION 260943.13**

## **SECTION 262416 - PANELBOARDS**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Load centers.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- B. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC; National Electrical Manufacturers Association.
- C. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association.
- D. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association.
- E. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association.
- F. NFPA 70 - National Electrical Code; National Fire Protection Association.

#### **1.04 SUBMITTALS**

- A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
- B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

- C. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangements.
- D. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

## **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

## **1.06 MAINTENANCE MATERIALS**

- A. Furnish two of each panelboard key.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. ABB
- B. Eaton Corporation
- C. Schneider Electric
- D. Siemens Energy and Automation Inc.
- E. Substitutions: Not Permitted.

### **2.02 LIGHTING AND APPLIANCE PANELBOARDS**

- A. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.
- B. Panelboard Bus: Copper, ratings as indicated. Provide full size neutral bus where neutral bus is indicated on the drawings. Provide copper ground bus in each panelboard. Provide full size insulated (isolated) ground bus where indicated on the drawings.
- C. Minimum Integrated Short Circuit Rating: as indicated on the drawings.

- D. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type, with common trip handle for all poles, UL listed.
  - 1. Type SWD for lighting circuits.
  - 2. Type HACR for heating and air conditioning equipment circuits.
  - 3. Class A ground fault interrupter circuit breakers where scheduled.
  - 4. Do not use tandem circuit breakers.
- E. Current Limiting Molded Case Circuit Breakers: With integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole; UL listed. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.
- F. Enclosure: NEMA PB 1, Type 1.
- G. Cabinet Box: 5.75 inches deep, 20 inches wide.
- H. Cabinet Front: Flush or surface type as indicated on the drawings, cabinet front trim with continuous concealed hinge on one side, and screw-on on the other side, metal directory frame, and hinged door with flush lock all keyed alike. Finish in manufacturer's standard gray enamel. Keys shall be furnished in duplicate.

## **2.03 LOAD CENTERS**

- A. Description: Circuit breaker load center, with bus ratings as indicated.
- B. Minimum Integrated Short Circuit Rating: as indicated on the drawings.
- C. Molded Case Circuit Breakers: Plug-on type thermal magnetic trip circuit breakers, with common trip handle for all poles; UL listed.
  - 1. Type SWD for lighting circuits.
  - 2. Type HACR for heating and air conditioning equipment circuits.
  - 3. Class A ground fault interrupter circuit breakers where indicated.
  - 4. Do not use tandem circuit breakers.
- D. Enclosure: General Purpose.

- E. Box: Flush or surface type as indicated on the drawings, with pull ring, latch on door, and directory frame. Finish in manufacturer's standard gray enamel.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.
- B. Install panelboards plumb. Install recessed panelboards flush with wall finishes.
- C. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.
- D. Provide filler plates for unused spaces in panelboards.
- E. Provide engraved plastic nameplates.
- F. Provide engraved plastic nameplate to each feeder circuit breaker in a power distribution panelboard.
- G. Provide typed or neatly handwritten circuit directory for each lighting and appliance panelboard and load center. The directory shall be placed in a clear plastic protective envelope and fastened to the directory frame. Revise directory to reflect circuiting changes required to balance phase loads.
- H. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.
  - 1. Minimum spare conduits: 3 empty 1 inch.
- I. Ground and bond panelboard enclosure.

### **3.02 ADJUSTING**

- A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

**END OF SECTION 262416**

## **SECTION 262717 - EQUIPMENT WIRING**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Electrical connections to equipment.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association.
- B. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

#### **1.06 COORDINATION**

- A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

- B. Determine connection locations and requirements.
- C. Sequence rough-in of electrical connections to coordinate with installation of equipment.
- D. Sequence electrical connections to coordinate with start-up of equipment.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. Wire and Cable
- B. Conduits
- C. Boxes
- D. Wiring Devices
- E. Enclosed Switches

### **2.02 EQUIPMENT CONNECTIONS**

- A. Provide equipment connection as shown on the drawings. Use type of conduit as specified in Section 26 0534. Provide field installed disconnect switch as shown on the drawings.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

### **3.02 ELECTRICAL CONNECTIONS**

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.



- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.
- J. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

**END OF SECTION 262717**

## **SECTION 262726 - WIRING DEVICES**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Wallplates.
- E. Poke-through service fittings.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association.
- B. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association.
- C. NEMA WD 6 - Wiring Device - Dimensional Requirements; National Electrical Manufacturers Association.
- D. NFPA 70 - National Electrical Code; National Fire Protection Association.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- B. Manufacturer's Installation Instructions.

## **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Products: Provide products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

## **1.06 EXTRA MATERIALS**

- A. Furnish two of each style, size, and finish wall plate.
- B. Provide two protective rings, split nozzles, or carpet rings.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Cooper Wiring Devices
- B. Hubbell Wiring Device - Kellems
- C. Lutron- For Wall Dimmers
- D. Pass and Seymour

### **2.02 WALL SWITCHES**

- A. Wall Switches: Heavy Duty, AC only general-use snap switch, complying with NEMA WD 6 and WD 1.
  - 1. Body and Handle: Ivory plastic with toggle handle.
  - 2. Ratings:
    - a. Voltage: 120 - 277 volts, AC.
    - b. Current: 20 amperes, unless otherwise noted on the drawings.
  - 3. Ratings: Match branch circuit and load characteristics.
- B. Switch Types: Single pole, double pole, 3-way, and 4-way, as noted on the drawings.

## **2.03 WALL DIMMERS**

- A. Wall Dimmers: Semiconductor dimmer for incandescent lamps, Type as indicated on drawings, complying with NEMA WD 6 and WD 1.
  - 1. Body and Handle: Ivory plastic with slider.
  - 2. Voltage: 120 volts.
  - 3. Power Rating: 600, 1000 watts, or as indicated on the drawings.
  - 4. Product: Lutron Nova T-Star, preset type.

## **2.04 RECEPTACLES**

- A. All Receptacles: Heavy duty, duplex specification grade complying with NEMA WD 6 and WD 1.
  - 1. Device Body: Ivory plastic, unless mentioned otherwise hereunder.
  - 2. Configuration: NEMA WD 6.
  - 3. Types: NEMA configuration, Type 5-20R, unless otherwise indicated on the drawings.
    - a. Single Convenience Receptacles
    - b. Duplex Convenience Receptacles
    - c. GFCI Receptacles: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements. Provide where indicated on the drawings.
    - d. Controlled Receptacles: Permanently marked from the factory to visually differentiate from uncontrolled receptacles. One or both of the outlets in the duplex shall be controlled as indicated by the circuitry shown on the drawings.
  - 4. Provide special receptacles (other than 5-20R) as shown on the drawings.

## **2.05 WALLPLATES**

- A. Jumbo Cover Plates: Ivory, smooth plastic.
- B. Coverplates: Type 302 satin finish stainless steel, 0.035 gauge thick. The coverplates for emergency receptacles shall be painted red in color.

- C. Weatherproof Covers: Weather-resistant receptacles shall be provided with while-in-use covers and associated wallplates, cast aluminum construction, NEMA 3R rated, UL listed, and meeting OSHA lockout/tagout requirements.
- D. Weatherproof Switchplates: Minimum IP44.

## **2.06 POKE-THROUGH FITTINGS**

- A. Poke-Through Fittings: Assembly comprising service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination. Cover shall be appropriate for floor covering type.
  - 1. Fire Rating: 2 hours.
  - 2. Listing: UL 514A.
  - 3. Type: Flush.
  - 4. Color: Brushed aluminum.
  - 5. Service Fitting Materials: Aluminum.
  - 6. Configuration: 3 (power, data, telephone) service furniture feed, and/or power receptacle and data and telephone outlets as indicated on the drawings.
  - 7. Conduit Stem: Refer to Poke-Thru Schedule on the drawings.
  - 8. Manufacturer: Hubbell, Wiremold, or approved equal.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that outlet boxes are installed at proper height.
- B. Verify that wall openings are neatly cut and will be completely covered by wallplates.
- C. Verify that floor boxes are adjusted properly.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- E. Verify that openings in access floor are in proper locations.

### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean debris from outlet boxes.
- C. Poke-thru fittings shall meet UL installation spacing requirements of minimum 2 feet on center, and not more than one fitting per 65 sq. ft. of floor area.

### **3.03 INSTALLATION**

- A. Install securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install devices plumb and level.
- C. Install switches with OFF position down.
- D. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- E. Do not share neutral conductor on load side of dimmers.
- F. Install receptacles with grounding pole on top for vertical installation, on the right for horizontal installation.
- G. Connect wiring device grounding terminal to outlet box with bonding jumper.
- H. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- I. Connect wiring devices by wrapping conductor around screw terminal.
- J. Use jumbo size plates for outlets installed in masonry walls.
- K. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- L. Install protective rings on active flush cover service fittings.

### **3.04 INTERFACE WITH OTHER PRODUCTS**

- A. Coordinate locations of outlet boxes to obtain mounting heights specified.
- B. Install wall switch 46 inches above finished floor.

- C. Install convenience receptacle 18 inches above finished floor.
- D. Install convenience receptacle 6 inches above counter.
- E. Install dimmer 46 inches above finished floor.
- F. Install telephone jack 18 inches above finished floor.
- G. Install telephone jack for side-reach wall telephone to position top of telephone at 54 inches above finished floor.
- H. Install telephone jack for forward-reach wall telephone to position top of telephone at 46 inches.

### **3.05 FIELD QUALITY CONTROL**

- A. Perform field inspection, testing, and adjusting.
- B. Inspect each wiring device for defects.
- C. Operate each wall switch with circuit energized and verify proper operation.
- D. Verify that each receptacle device is energized.
- E. Test each receptacle device for proper polarity.
- F. Test each GFCI receptacle device for proper operation.

### **3.06 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.

### **3.07 CLEANING**

- A. Clean exposed surfaces to remove splatters and restore finish.

**END OF SECTION 262726**

## **SECTION 265100 - INTERIOR LIGHTING**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Interior luminaires and accessories.
- B. Emergency lighting units.
- C. Exit signs.
- D. Luminaire accessories.
- E. LED (light emitting diode) luminaires.
- F. LED drivers and controls.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. ANSI C78.379 - American National Standard for Electric Lamps - Reflector Lamps - Classification of Beam Patterns.
- B. ANSI C78.377 American National Standard for Electric Lamps - Specifications for the Chromaticity of Solid-State Lighting Products.
- C. NECA/IESNA 500 - Recommended Practice for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association.
- D. NECA/IESNA 502 - Recommended Practice for Installing Industrial Lighting Systems; National Electrical Contractors Association.
- E. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association.
- F. NFPA 70 - National Electrical Code; National Fire Protection Association.
- G. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association.



#### **1.04 SUBMITTALS**

- A. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- B. Product Data: Provide dimensions, ratings, and performance data.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Data sheet for ballast showing power factor, THD, type of start, multi-voltage application.
- E. Data sheet for all types of lamps showing nominal wattage, color temperature, initial lumen, CRI, and average rated life.
- F. Operation and Maintenance Data: Instructions for each product.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70 and NFPA 101.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years' experience.
- C. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

#### **1.06 EXTRA MATERIALS**

- A. Furnish two of each plastic lens type.
- B. Furnish two replacement lamps for each lamp type.

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Luminaires: As indicated on the luminaire schedule.

#### **2.02 LUMINAIRES**

- A. Luminaire:

1. Product: Furnish product as indicated in the luminaire schedule.
- B. Exit Signs: Exit sign fixture suitable for use as emergency lighting unit.
  1. Housing: Extruded aluminum.
  2. Face: Aluminum stencil face with red letters.
  3. Directional Arrows: Universal type for field adjustment.
  4. Mounting: As indicated; wall; ceiling; pendant; or universal for field selection.
  5. Battery: 6 or 12 volt, nickel-cadmium; lead calcium type, with 1.5 hour capacity.
  6. Battery Charger: Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within twelve hours.
  7. Lamps: LED.
  8. Input Voltage: As shown on the luminaire schedule.
  9. Accessories:

## **2.03 LED LUMINAIRES**

- A. The manufacturer offering this item shall have been in business for a minimum of five years and shall have successfully produced at least 1000 (one thousand) identical or similar models to that being tendered.
- B. Luminaire shall be mercury-free, lead-free, and RoHS compliant.
- C. Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
- D. Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.
- E. White LED shall meet chromaticity standards set by ANSI C78.377. Light output of the LED system shall be measured using the absolute photometry method following IES LM-79 and IES LM-80 requirements and guidelines.
- F. Driver shall have a minimum rated life of 50,000 hours.
- G. Color temperature shall be 3500K, unless otherwise noted on the Luminaire Schedule.

- H. The manufacturer of the Luminaire shall utilize LEDs with proven quality. LED drivers to be compatible with LEDs. Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.
- I. Luminaire Color Rendering Index (CRI) shall be a minimum of 70 for exterior fixtures, and a minimum of 80 for interior fixtures, unless otherwise noted on the Luminaire Schedule.
- J. LED fixture shall be thermally designed as to not exceed the maximum junction temperature of the LED for the ambient temperature of the location the fixture is to be installed. Rated case temperature shall be suitable for operation in the ambient temperatures typically found for the intended installation. Exterior luminaires to operate in ambient temperatures of -20°F to 122°F (-29°C to 50°C).
- K. LED driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at full input power and across specified voltage range.
- L. Luminaire shall operate normally for input voltage fluctuations of plus or minus 10 percent and shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
- M. Electrical components of the LED lighting fixture (LED light engine/board array and driver(s)) shall be of modular construction so that each component is individually replaceable in the field for maintenance and repair purposes. Wiring connecting these components shall utilize polarized quick-disconnects.
- N. All connections to luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
- O. Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected as per Class 2 UL listing. All luminaires shall be provided with knockouts for conduit connections.
- P. The LED lighting fixture shall carry a limited 5-year warranty minimum for LED light engine/board array, and driver.
- Q. LED driver shall be compatible with dimming controls where dimming is indicated on the plans. Dimmable drivers shall use Dimming Constant Current (DCC) or Pulse Width Modulation (PWM) operation.

## **2.04 EMERGENCY LIGHTING CONTROL UNIT**

- A. The emergency lighting control unit (ELCU) shall provide all required functionality to allow any standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building.
- B. The ELCU shall have control of emergency lighting fixtures in tandem with normal lighting in an area, while ensuring that emergency lighting will turn on to full brightness upon loss of normal power supplying the control device.
- C. The device shall have normally closed dry contacts capable of switching 20A loads at 120-277 VAC, 60 Hz (ballast).
- D. The unit shall automatically switch emergency lighting "ON" and "OFF" as normal lighting is switched. When normal power is not available, the ELCU shall force and hold emergency lighting "ON" regardless of the state of any external control device until normal power is restored.
- E. The unit shall be plenum-rated and UL listed/labeled with a warranty of five years.

## **2.05 ACCESSORIES**

- A. Product: Diffusers:
  - 1. Plastic lenses, diffusers or shields specified shall be 100% virgin acrylic, Plexiglas or polycarbonate in sizes and shapes to property fit the luminaire.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) or NECA 501 (industrial lighting).
- B. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- C. Support luminaires larger than 2 x 4 foot size independent of ceiling framing.
- D. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
- E. Install surface mounted luminaires and exit signs plumb, and adjust to align with building lines and with each other. Secure to prevent movement. Continuous rows longer than 16 feet shall be mounted on steel channel, which shall be suspended from structural ceiling with aligner hangers.

- F. Exposed Grid Ceilings: Support surface mounted luminaires in grid ceiling directly from building structure.
- G. Exposed Grid Ceilings: Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires.
- H. Exposed Grid Ceilings: Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips.
- I. Install recessed luminaires to permit removal from below to allow access to an outlet box in the ceiling, as required by NEC.
- J. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- K. Install clips to secure recessed grid-supported luminaires in place.
- L. Install wall mounted luminaires, emergency lighting units, and exit signs at height as indicated on Drawings.
- M. Install accessories furnished with each luminaire.
- N. Connect luminaires, emergency lighting units, and exit signs to branch circuit outlets provided under Section 26 0537 using flexible conduit.
- O. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- P. Bond products and metal accessories to branch circuit equipment grounding conductor.
- Q. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.
- R. Interface with air handling accessories furnished and installed under Section 23 3600.
- S. Provide any baffles and/or gaskets needed to prevent light leaks around luminaires.
- T. Recessed luminaires shall be designed to fit the make and type of ceiling to be installed, and shall include plaster frames where installed in plaster ceilings, mounting yokes where required for support from ceiling construction, and independent support form structure members where the weight of luminaires would cause deformation of the ceiling.
- U. LED fixtures shall have 3-inches of space separation with duct or pipe insulation above to allow heat dissipation. LED drivers shall be accessible.

### **3.02 FIELD QUALITY CONTROL**

- A. Perform field inspection, testing, and adjusting.
- B. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

### **3.03 ADJUSTING**

- A. Aim and adjust luminaires as directed.
- B. Position exit sign directional arrows as indicated.

### **3.04 CLEANING**

- A. Clean electrical parts to remove conductive and deleterious materials.
- B. Remove dirt and debris from enclosures.
- C. Clean photometric control surfaces as recommended by manufacturer.
- D. Clean finishes and touch up damage.

### **3.05 DEMONSTRATION AND INSTRUCTIONS**

- A. Demonstrate luminaire operation for minimum of two hours.

### **3.06 PROTECTION**

- A. Relamp luminaires that have failed lamps at Substantial Completion.

### **3.07 LUMINAIRE SCHEDULE**

- A. Refer to drawings.

**END OF SECTION 265100**

## SECTION 271000 – TELECOMMUNICATIONS CABLING

### PART 1 - GENERAL

#### 1.1 GENERAL REQUIREMENTS

- 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. Work of this Section includes all labor, materials, equipment and services necessary to complete the provision of voice and data telecommunication system cabling related work indicated on the IT drawings and specified in this Section.
- B. Work includes, but is not necessarily limited to, the following:
  - 1. Backboxes, conduit, conduit sleeves, cable trays and wiring devices for the voice, data and DAS systems and fiber backbone and work indicated on the construction drawings.
  - 2. All conduit shall be concealed in occupied spaces except where specifically allowed.
  - 3. Provision of CAT 6A plenum cable, single mode fiber optic backbone cable, patch panels, patch cords, equipment racks with power distribution units, voice-data receptacle plates, cable trays and all other equipment and work indicated on the drawings.
  - 4. Provide labor, materials, equipment, services, and operations required for the installation of complete and operational telecommunication cable plant as indicated on the drawings and/or specified herein.
  - 5. The work shall include all materials and labor required for the installation of a complete and operational system that complies with all EIA/TIA guidelines, standards, and applicable codes.
  - 6. Labeled voice-data faceplates, RJ45 jack modules, labeled patch panels, copper and fiber patch cords, workstation patch cables, grounding bar at each IT rack. See Part 2 for additional information
  - 7. Equipment racks shall be provided with all required termination equipment, power distribution units (PDUs), UPS and wire management products.
  - 8. Grounding system shall be provided in accordance with ANSI/TIA/EIA-607 for technology equipment in each rack location.
  - 9. Verification of dimensions and conditions at the job site prior to equipment installation.
  - 10. Coordination with associated trades.
  - 11. Certification of wire performance.
  - 13. See IT drawings for more information.
- C. Any additional materials or services needed in order to meet the general requirements stated above, even if not specifically mentioned herein or on the drawings, shall be provided by the Contractor without claim for additional payment.

#### 1.3 QUALITY ASSURANCE

- A. Work shall be done by persons skilled in this trade in strict accordance with the requirements

construction building of at least 20,000 sq. ft. References, complete with contact information, must be submitted during bid submission. and/or specifications of the manufacturers of the material being used. Vendor must provide named references / contacts from three or more clients where vendor has installed cable in a new

- B. Coordinate work with that of all other trades affecting or affected by the work of this Section. Cooperate with such trades to assure steady progress of all work under Contract.
- C. All electrical equipment and materials shall have the listing of the Underwriters' Laboratories, Inc., and shall bear the labels attesting to UL listing, and types approved by the Municipal Departments having jurisdiction.
- D. Additional Reference Standards:
  - 1. Published specifications, standards, tests, or recommended methods of trade, industry or governmental organizations apply to work in all sections as notes below:
    - a. OSHA - Occupational Safety and Health Administration Regulations.
    - b. NEMA - National Electrical Manufacturers Association
    - c. UL - Underwriter's Laboratories
    - d. NFPA - National Fire Protection Association
    - e. ANSI – American National Standards Institute
    - f. CCIA – Computer Communications Industry Association
    - g. EIA - Electronics Industries Alliance
    - h. FCC - Federal Communications Commission
    - i. ITU - International Telecommunications Union
    - j. NEC - National Electric Code
    - k. Building Infrastructure Consulting Service International (BICSI)  
Telecommunication Methods Manual, 10<sup>th</sup> Edition and Information Transportation  
Systems Installation Manual, 4<sup>th</sup> Edition
    - l. TIA – Telecommunications Industry Association
      - 1) TIA/EIA 526-7 Measurement of Optical Power Loss of Installed Single Mode Fiber Cable Plant Standard 1998
      - 2) TIA/EIA 526-14A Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant Standard 1998
      - 3) TIA/EIA 568-B.1 Commercial Building Telecommunications Cabling Standard General Requirements 2001
      - 4) TIA/EIA TSB67 Transmission Performance Specifications for Field Testing of Unshielded Pair Cabling Systems.
      - 5) TIA/EIA 606A Administration Standard for Commercial Telecommunication Infrastructure 2002.
      - 6) J-STD-607-A Commercial Building Grounding and Bonding Requirements for Telecommunication Standard 2002
- E. The contractor shall use the University's on-call tele/data vendor:  
Kane Communications  
Project Manager: Mike Schaffer

Kane full-fills the fowling requirements of the University:

- 1) The tele/data contractor must be an authorized representative of Siemon and of the major equipment items specified including but not limited to patch panels, cable and all other major components of the system equipment specified herein.
- 2) The tele/data contractor shall have successfully provided installation and engineering services over completed installations for a period of



three years or more and shall have completed at least five major system installations of this type. IRT shall be the final judge of suitability of experience.

- 3) Installation in accordance with Siemon Certified Installer protocol to maintain campus- wide 30-year warranty. Specifically, 30% of installation technicians must be certified on fiber and copper installation. Proof of certification or equal certification must be provided. Installer must have at least two certified Registered Communications Distribution Designers (RCDD) on permanent, full-time staff to maintain campus-wide 30-year warranty. Proof of Certification must be provided to the University prior to commencement of installation work.

#### 1.4 DEFINITION OF TERMS

- A. The term Electrical Contractor / Telecommunication Contractor as used herein refers to the party responsible for supplying all materials and services specified herein and indicated on related drawings.
- B. The term "This Contractor" or "Communication Contractor" (CC) as used herein refers to the party responsible for providing telecommunication equipment and services specified herein.
- C. The term "provide" shall mean to supply and install.

#### 1.5 JOB CONDITIONS

- A. Investigate the nature and location of the Work, the general and local conditions, particularly those bearing upon the Work required such as: transportation, disposal, handling and storage of materials, availability of labor, electric power and physical conditions at the site and character of equipment and facilities needed during the execution of the Work. Obtain all information that can affect the Work, or cost thereof under the Contract.
- B. The Contractor shall coordinate shop drawings well in advance with other trades. It is the Contractors sole responsibility to obtain all necessary information from other trades.

#### 1.6 SUBMITTALS

- A. Shop drawings and samples shall be submitted in accordance with the requirements established in the General Conditions or specified elsewhere and shall in addition include at minimum the following:
  1. Plan, elevation, section as required to fully illustrate all power, telephone, voice, data, fire alarm, outlets, including all system wiring devices such as pull boxes, conduit in slab, stub-up locations, outlet boxes, cable trays indicated on the IT, AV and Electrical drawings including conduit and cable routing (1/4" = 1'-0" min.)
  2. The Contractor shall coordinate shop drawings well in advance with other trades. It is the Contractors sole responsibility to obtain all necessary information from other trades.
  2. Plans to include nomenclature for face plate receptacle ID numbers.
  3. Detail layout of equipment in IDF closets including rack elevations, plan layout, grounding detail, etc.
  4. Provide color coded plans to of items described above in paragraph #1.
  5. Submit manufacturer's product data sheet on each component to the Information Technology Cable Plant including but not limited to:
    - a. Sample and product data of each cable type to be used, patch panel, face plate, RJ45 receptacle, cable and receptacle type used in the system.
    - b. Typical back box for mounted in concrete (2 gang with 1 gang extension and cover plate).
  6. Typical back box for mounted in in gypsum wall board (2 gang with 1 gang extension and

cover plate). Pull Schedules that shall include cable ID, cable length, Patch Panel Termination Frame ID, Port/Position number, Cabinet ID, Riser ID.

- B. The following samples shall be provided to the Architect and IRT for review prior to installation:
1. Specified cover plates with jack modules for wall, ceiling and floor box locations. Sample shall include proposed jack identification. Note – face plates for visible wall or ceiling mounted location to be custom finish and color.
  2. Cable labels.
  3. Cable dressing materials.
  4. Wire management hardware such as J-Hooks, cable ties, etc.
  5. Patch panel with labeling and cable dressing.
  6. Each floor box type with specified cover plate installed.
- C. As-Built drawings.
1. During the progress of the work, Contractor shall make a careful record of all changes by which the actual installation differs from that indicated on the Bid Documents. Upon completion of work, Contractor shall compile a complete set of the design drawings with all changes incorporated electronically. Visibly indicate changes and deviations from scope with “clouds” or similar technique for identifying changes to the drawings.
  2. Prior to contract closeout, submit two (2) hard copy of the system record drawings and documents to Owner and Architect. The drawings shall be “D” size and laminated. The laminated shall be permanent attached in the MDF and IDF(s). The Contractor will be required to make any requested changes to documents before a final approval and acceptance is issued.
  3. Upon approval from the Architect and Owner, submit two (2) hard copies of the “as-built” drawings to the Owner in accordance with the General Conditions. In addition, provide electronic files of all record drawings in AutoCAD 20018 format and PDF.
  4. The “as-built” drawings shall include all ladder rack and basket tray routing, cable routing, outlet and cable labeling, telecommunication room layouts and equipment elevations.
  5. Cable pull schedules shall be updated as necessary and submitted with the drawings.
- D. Test Results:
1. Prior to systems acceptance and commissioning, submit system-testing documentation showing methods and results for all tests performed.
  2. If certain equipment is determined to be exempt from system testing, the Contractor shall state that the equipment was not tested (in written form), and provide specific reasons for the exclusion of test results for said equipment, cabling, or system.
  3. Electronic cable tests must be submitted to Architect for review in a PDF format. Subsequent field changes may be required to remedy poor test results.
  4. This Contractor will submit the test results (30) thirty days prior to Substantial Completion to allow for field changes prior to the expected move-in date.

#### 1.7 DELIVERY, STORAGE AND HANDLING

- A. Protect product from damage. Comply with all manufacturers’ recommendation for handling, storage and protection.

#### 1.8 WARRANTY

- A. For the duration of installation and warranty period, service calls must be responded to within two hours of request, by arrival of technicians and equipment to project site.
- B. Project will be required to receive Siemon A thirty (30) year premium Siemon Cabling System® Z-MAX®, warranty covering products, performance and applications assurance for

cabling systems designed and installed by Siemon Certified Installers in a registered cabling system using Siemon connecting hardware and qualified cable.

## 1.9 PUBLICATION

- A. Written approval from the Owner shall be obtained prior to the release of any information concerning this project.

## PART 2 - PRODUCTS

### 2.1 DESCRIPTION OF SYSTEMS

- A. Provide all raceways, back boxes, pull boxes, sleeves, and floor boxes indicated in the documents for interconnection among and between the devices comprising the systems indicated in Part 1 above.
- B. All raceways and related equipment shall be provided as per applicable sections of electrical specifications, the Drawings and in accordance with the National Electrical Code and local codes having jurisdiction.
- C. See electrical drawings and specifications for additional requirements.

### 2.2 GENERAL REQUIREMENTS

- A. All materials and components shall be new and of manufacturer's finest quality as appropriate to the application.
- B. Uniform materials and components shall be used throughout, and wherever possible, shall be field replaceable and commonly available.
- C. All materials shall conform to applicable UL standards and to general electrical requirements unless specifically accepted by requirements of this section.
- D. See applicable sections of Division 26 for more information.

### 2.3 DUCTS

- A. General Requirements.
  - 1. All floor boxes shall be UL listed for scrub water and all other code requirements.
  - 2. Floor boxes shall be modified where necessary to accommodate specified conduit size and quantities.
  - 3. Conduits shall be routed to appropriate side of box accommodating services as described below.
  - 4. See AV Drawings for floor box details.
  - 5. For cast in concrete boxes, particular attention shall be paid to setting the proper elevation of the box to accommodate floor finishes. Refer to architectural drawings for more information. Any adjustments required to create a perfectly smooth transition from adjacent finish floor materials to box cover shall be the responsibility of this contractor.
  - 5. For all cast in place boxes with occupied spaces below, provide fire separation material below to maintain fire rating.
  - 6. Routing of conduits in slab and above finish ceilings shall be coordinated with structural requirements.
  - 7. Refer Architectural drawings for information regarding ceilings that no space for conduit above the finish ceiling. In these areas, conduit must be embedded in concrete.
- B. Flush Floor Box
  - 1. Floor boxes shown on the IT drawings are multi-service.

2. Floor box that includes AV, IT and power is specified in Specification 274100. Floor box for power and IT only or power and Exhibition shall be provided with concrete pour pan accessory.
5. Floor box shall be provided with removable cover.
6. Acceptable Manufacturer:
  - a. Box: FL-200-3  
Cover: FL-200-SLD-ALU-C  
FSR Incorporated
  - b. Or Equal.

C. DAS Antenna and Splitter NEMA 1 Boxes

1. Pull boxes shall be in accordance with NEMA/EEMAC Type 1, UL 50 Type 1 and IEC 529, IP30.
2. Box shall be fabricated from 14 gauge steel.
3. Box shall be provided with screw cover plates for flush mounting.
4. Knockouts for conduits shall be as required to meet conduit sizes indicated on plans.
5. Box and screw cover shall be finished with dark gray enamel inside and out.
6. Acceptable Manufacturers:
  - a. Size to be 24" x 24" x 6"  
Type 1 Bulletin A90P1 Screw Cover Pull Boxes by Hoffman
  - b. Or Equal.

D. Electrical Work Embedded In Concrete

1. Provide suitable PVC ENT, (Electrical tubing) or rigid conduit, pull boxes for conduit and fitting for conduit paths to be encased in concrete.
2. Any ENT used shall meet the requirements of UL Standard UL 1653 and shall be listed by Underwriters Laboratories, Inc., as suitable for its intended purpose.
3. shall be recognized by a CABO National Evaluation Report for use in 1-hour and 2- hour rated construction.
4. Penetration of fire rated walls, floors or ceilings shall use classified Through-Penetration Firestop Systems described in the current Underwriters Laboratories Fire Resistance Directory.
5. Fittings, accessories and outlet boxes shall be designed for use with selected conduit. All components shall be listed by Underwriters Laboratories and shall be from one manufacturer.
6. Unless indicated differently on drawings, ENT systems shall be color coded: BLUE for low voltage power, YELLOW for other low voltage communications, For PVC conduit, conduit shall be painted in similar color schedule at each end or at pull box locations.

E. Electrical Work Not Embedded in Concrete

1. Provide suitable PVC ENT, (Electrical tubing), pull boxes for conduit and fitting for conduit paths not encased in concrete.
2. Any ENT used shall meet the requirements of UL Standard UL 1653 and shall be listed by Underwriters Laboratories, Inc., as suitable for its intended purpose.
3. shall be recognized by UL port for use in 1-hour and 2-hour rated construction.
4. Penetration of fire rated walls, floors or ceilings shall use classified Through-Penetration Firestop Systems described in the current Underwriters Laboratories Fire Resistance Directory.
5. Fittings, accessories and outlet boxes shall be designed for use with selected conduit. All components shall be listed by Underwriters Laboratories and shall be from one manufacturer.
6. Unless indicated differently on drawings, ENT systems shall be color coded: BLUE for low voltage power, YELLOW for other low voltage communications, For PVC conduit,

conduit shall be painted in similar color schedule at each end. Receptacle boxes, located on the drawings for IT raceway system, shall be in accordance with NEMA/EEMAC, UL 50 Type 1 and IEC 529, IP30.

7. Boxes shall be fabricated from 16 gauge or 14 gauge steel. All boxes shall be provided with cover plates for flush mounting except where otherwise noted. Knockouts for conduits shall be as required to meet conduit sizes indicated on plans.
8. Ceiling box projector location shall be mounted adjacent to the video projector power outlet.
9. Typical recessed device backbox shall be (2) gang, 2-1/8" deep with (1) gang reducer to accept one gang finish plate. For mounted conditions, shall be 1 gang.
10. Provide knock-out for 1-1/4" EMT conduit stub-up to nearest cable tray or accessible ceiling where provided. If there is no accessible ceiling, extend conduit rack or to pull in storage rooms, janitors' closet, toilet rooms.
11. Acceptable Manufacturers:
  - a. Midland Ross, Leviton, Steel City, Hubbell, or Equal for EMT conduit
  - b. Thomas and Betts, Allied, Carlon Sales or Equal for ENT conduit.
  - c. See electrical specification for additional manufacturers.

F. Conduit Sleeves

1. Conduit sleeves where indicated on the IT drawings shall be installed in accordance with applicable sections of the electrical specifications and as described herein.
2. Conduit sleeves shall be provided with insulated bushings at each end.
3. Sleeves without exception shall be treated to create an airtight condition. Where sleeves pass through a fire rated partition or floor all penetrations to be code compliant.
4. The exact size of conduit sleeves will be as required to have a maximum of 60% cable fill.
5. Confirm all location of all sleeves with the Architectural drawings.
6. Acceptable Manufacturer:
  - a. Series 33 by STI Firestop
  - b. Or Equal

2.4 STRUCTURED CABLING CABLE

A. Pair Category 6A UTP Cable

1. Cable shall be 100-Ohm, 4-pair unshielded twisted pair cable with 24 AWG solid copper conductors.
2. Cable shall be plenum rated.
3. Cable shall meet or exceed all performance characteristics specified in the ANSI/TIA/EIA-568-B-2.1 Draft 10 standard for Category 6A cable.
4. all support 1000BASE-T, 1000BASE-TX, and all current applications designed to be supported by Category 6A.
5. Cable shall be Siemon P/N 9C6P4A505AR1ARU or equal with yellow jacketing labeled with "Rowan University" and the production date; to be compatible with University-wide standards.

B. Copper Patch Cords

1. Cords shall consist of 4-pairs of 24 AWG stranded copper conductors.
2. Modular plugs (RJ-45 type).
3. 100% transmission tested with laboratory grade network analyzers for proper performance up to 500 MHz. shall guarantee cords are compatible with Category 6A channels.

4. VERIFIED (or equivalent) for TIA/EIA Category 6A electrical performance.
5. provide a quantity of patch cords to patch the work area, MDF and IDF rooms terminations.
6. Patch cords shall be ordered in lengths that will leave no more than 18 inches of slack in any single patch, based on telecommunication room equipment layout.
7. Provide labor and materials to perform patches based on the number of ports installed to Owner furnished network electronics.
8. Cable shall be Category 6A, color blue, by Siemon.

C. Fiber Optic Cable

1. Cable shall be 50-micron singlemode (OS2) fiber optic cable.
2. Cable shall be plenum rated (NEC Classification: OFNP)
3. Cable shall meet or exceed all performance characteristics specified in the ANSI/TIA/EIA-568-B.03 standard for singlemode fiber optic cables.
4. Attenuation change vs wavelength 1285 to 1330 nm.
5. Maximum Dispersion at 1310/1550 nm  $\leq 3.2/18.0$  ps/nm x km
6. Strand quantities shall be as indicated on drawings.
7. Singlemode fiber optic cabling shall be an armored cable with yellow jacket.
8. Provide labor and materials to perform fiber patch cord connections to each Owner furnished network switches. Exact length to be determined. For bid purposes average length to be 10'-0"
9. Cable shall be by Siemon or equal.

2.5 STRUCTURED CABLING TERMINATION HARDWARE

A. 48-Port Category 6A UTP Patch Panel

1. Patch panels shall be used for terminations of horizontal voice, data and wireless access point cables in IT racks called for on the drawings.
2. Provide sufficient quantities to terminate each voice, data and wireless access point cable indicated on drawings.
3. Provide separate patch panel for Wireless Access point cabling, wiring to video projectors and AV racks.
3. Patch panels shall be modular to 110-type patch panels, complete with Category 6A T568B RJ45 jacks.
4. Patch panels shall be high density, 19-inch rack mountable and one (1) rack units high.
5. Provide one (2) rack unit cable management panel for each patch panel provided.
6. Patch panels shall be Siemon Z6A-PNL-U48K.

B. Fiber Optic Connect Panel

1. Terminate fiber optic riser cable in IT racks called for on the IT drawings.
2. shall be 3 RU high and provided with fiber adapter panels with LC connectors for each strand of fiber cable.
3. Rack-mountable in standard 19-inch EIA racks.
4. Fiber enclosure shall be RIC3-72-01 by Siemon. IDF Fiber enclosure shall be RIC3- 24-01 Siemon or approved equal.
5. Fiber adapters shall have 24 strand LC connectors and shall be RIC-F-L(X)Q24-01C by Siemon.

2.6 STRUCTURED CABLING WORK AREA TERMINATION HARDWARE

A. Voice-data outlet faceplates

1. Faceplates shall be installed at all wall mounted outlet locations to accommodate termination modules and connectors for horizontal cabling.
2. See drawings for quantities, locations and configurations.
3. Single gang faceplate.
4. Outlet faceplate shall be manufactures standard color. Provide blanks for ports not used.
5. IT plates for floor boxes can be standard white.
6. All visible voice-data locations, unless noted otherwise, shall be provided with the exact same faceplate.

B. Wall Phone Faceplates

1. Faceplate shall be used at all wall phone locations to terminate horizontal cable and mount phone.
2. See drawings for quantities, locations and configurations.
3. Faceplate shall have mounting studs for telephone.
4. Faceplate shall be arctic white with a single RJ45 port in white.

C. Category 6A RJ45 Jacks

1. Shall be used for termination of horizontal voice cabling at work area outlet.
2. EIA/TIA 568B termination.
3. Color: White

D. Faceplate Labels

1. Shall be used to label all outlets.
2. Color: White
3. Labels shall be generated on Brother P-Touch.
4. Faceplate numbering method shall be in accordance with Owner's standards.
5. Submit sample for review

## 2.7 STRUCTURED CABLING SUPPORT EQUIPMENT

A. Cable Termination Equipment Racks for MDF and IDF closets:

1. Rack shall be used for mounting of patch panels, wire management and network switches.
2. Rack shall be 45 rack units and 19-inch mountable with standard EIA hole spacing.
3. Racks shall be bolted to slab at front and rear flanges and tied to overhead ladder rack for additional stability with treaded rod and steel channels from Unistrut or Kindorf.
4. Racks shall be grounded by a #6 AWG wire with green insulation to ground bus bar. Use lug type connectors at each end.
5. Racks shall be provided with equipment mounting screws (50 per rack minimum).
6. Each rack shall be provided with double sided vertical cable management such as Chatsworth #14831-703.
7. Racks shall be provided with power distribution units to connect to 5KVA UPS. See paragraph B below.
8. Provide 6" wide vertical cable management accessory.
9. Approved Cable Termination Rack:
  - a. Chatsworth 46353-B03
  - b. Or Equal

B. IT Rack UPS and PDU

1. Rack mounted UP rated at 5KVA.  
APC #SRT5KRMXL

2. Power distribution unit:
3. APC PDU1230 Front Mount
4. Network Card:
  - a. APC #9618
5. Two Post Rack Mount: APC AP9625 or equal

C. Cable Tray

1. In IT closets, provide cable tray and all required fittings, transition members, junction and butt splice kits, radius bend members, protective end caps, end closing hardware, support brackets and attachment hardware for cable tray where indicated on the drawings.
2. Cable tray shall be UL listed and fabricated from wire mesh shall be nominally 2" high by 18" wide or per width called out on the drawings.
3. Cable tray shall be grounded to copper bus bar.
4. Acceptable Manufacturer:
  - a. Cablofil CF54
  - b. Or Equal.

D. Ladder Rack

1. Provide vertical ladder racks and all required fittings, floor mounts, support brackets and attachment hardware of ladder rack to wall in each IT closet for transitions from floor or ceiling conduits that stub up from slabs.
2. Ladder rack shall be UL listed and fabricated from aluminum shall be nominally 2" high by 18" wide or per width called out on the drawings.
3. Provide grounding of ladder if required by code.
4. Acceptable Manufacturer:
  - a. Cablofil PW Series
  - b. Or Equal.

E. Cable Management Straps

1. Cable straps shall be installed to support horizontal cabling.
2. Spacing between straps shall not exceed five (5) feet.
3. Cables must be neatly bundled and tied at each strap and at the midpoint of each span between straps.
4. Safe-T-Grip cable support straps by Chatsworth or equal.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine all work prepared by others to receive work of this Section and report any defects affecting installation to the Architect for correction.
- B. Commencement of work will be construed as complete acceptance of preparatory work by others.
- C. All devices shall be installed as per applicable sections of Division 26 and in accordance with the National Electrical Code.
- D. All conduits shall be concealed in occupied spaces.



### 3.2 GENERAL REQUIREMENTS

- A. Contract Drawings are diagrammatic and indicate general arrangement of systems and work included. Verify exact location of all electrical devices with architectural drawings. If a dimension is not indicated on either the architectural or IT drawings, request in writing, required information prior to proceeding. Any work installed without written direction that is not specifically indicated on the drawings may be rejected and relocated at Contractor expense. All finish or other work by others damaged by relocation of any electrical device shall be the responsibility of the Contractor.
- B. Final location of all equipment shall be located as shown on Contractor's reviewed Shop Drawings, or as located in the field by the Architect, or as shown on supplementary drawings prepared by the Consultant. Check drawings of other trades relating to work to verify spaces in which work will be installed. In centering outlets and locating boxes allow for overhead pipes, ducts and mechanical equipment, variations in fireproofing and plastering, window and door trim, paneling, hung ceilings, and the like, and correct any inaccuracy resulting from failure to do so without expense.

### 3.3 RACEWAYS

#### A. General Requirements for Electrical Work

- 1. No exposed raceways shall be permitted except in rooms with no hung or finished ceiling.
- 2. Pull no wire, insert no fish wire, until raceway and outlet boxes are permanently in place.
- 3. Provide cable supports for wire in riser conduits as required by code, if applicable.
- 4. Provide pull boxes in horizontal conduit running every 100 feet as indicated or wherever necessary to facilitate pulling in of wire. Coordinate locations with other trades to provide access.
- 5. Flexible conduit shall not be permitted.
- 6. All conduit penetrations through acoustically rated partitions shall be a maximum of 1/2" larger than the penetrating conduit and shall be thoroughly caulked with acoustical non-setting caulk.
- 7. Provide drag lines with conduit destination noted on drag line to facilitate pulling of cable.

#### B. Raceway Grounding & Isolation

- 1. Signal conduits shall be mechanically and electrically connected to receptacle boxes and shall be electrically isolated from system equipment racks. Connect all signal conduits with heavy insulated ground wire to the ground of the nearest ground of a utility panel.
- 2. Provide terminals of conduits with lock nut and insulated bushing for connection to pull boxes servicing more than one conduit subsystem as described in the separation Guide Identification table below.

### 3.4 STRUCTURED CABLE PLANT INSTALLATION

#### A. Cable Installation:

##### 1. General:

- a. All cables, regardless of length, shall be marked with wrap-around typed number or letter cable markers at both ends. There shall not be any unmarked cable at

any location. Cable numbers shall correspond to the workstation termination label.

- b. No cable shall be installed with a bend radius less than that recommended by the cable manufacturer. As a guideline, the typical minimum bend radius for copper cable is four (4) times the outside diameter of the cable. The typical minimum bend radius for fiber optic cable is ten (10) times the outside diameter of the cable.
- c. The maximum cable pulling tensions shall not exceed manufacturer's specifications.
- d. Cables shall not contain splices, unless specifically required for performance of the system.
- e. All cable terminations involving F-type, RJ45, and other connectors, shall be firmly crimped. "Screw-on" connectors and other similar connector types are considered unreliable and shall not be used for this project.

2. Cable Pathways:

- a. Grounding and bonding of pathways shall comply with EIA/TIA 607 grounding standards and applicable codes and regulations.
- b. Pathways shall not have exposed sharp edges that may encounter telecommunications cables.
- c. The number of cables placed in a pathway shall not exceed manufacturer specifications or distort the geometric shape of any cables within.
- d. Maximum pathway capacity shall not exceed a 40% fill.
- e. Pathways shall not be located in elevator shafts.
- f. All horizontal cables, regardless of media type, shall not exceed 90-meters (295 ft) from the telecommunications outlets in the work area to the horizontal cross connect location. No cable run shall be terminated and tested at a length beyond 90-meters.
- g. Telecommunications pathways, spaces, and metallic cables, which run parallel with electric power or lighting that is less than or equal to 480 Vrms, shall be installed with a minimum clearance of 12 inches.

3. Cable Supports:

- a. All cable supports in an open ceiling shall be structurally independent of the suspended ceiling, its framework, and supports. Cable supports shall be spaced no more than 5-feet apart.
- b. Cables routed in a suspended ceiling shall not be draped across the ceiling tiles. Cable supports shall be mounted a minimum of 3-inches above the ceiling grid supporting the tiles.
- c. Contractor shall observe the manufacturer's recommended bending radius and pulling strength requirements of all cables during handling and installation.
- d. In the IDF rooms or chases where cable ladder racks are used, Contractor shall provide Velcro cable ties to create a neat appearance.

4. Cable Slack:

- a. In the work area, a minimum of 12 inches of cable should be coiled up in the electrical back box so the faceplate and jacks can be serviced, if necessary. Additionally, a minimum of 3 feet of cable slack shall be coiled above the ceiling to re-position the outlet, if necessary.
- b. In the telecommunications rooms a minimum of six (6) feet of slack should be left for all cable types. This slack must be neatly managed on trays or other support types above the ceiling.

- c. Provide ample cable slack to allow for servicing equipment racks that are located against a wall or other permanent interfering surface. Create an umbilical cord, or similar method of containing the cables.
- 5. Cable Tie-Wraps:
  - a. Velcro tie-wraps shall be used at appropriate intervals to secure cable and to provide strain relief at termination points. These wraps shall not be over-tightened to the point of deforming or crimping the cable sheath.
  - b. Hook and loop cable managers (Velcro or similar) should be used in the telecommunications rooms where reconfiguration of cables and terminations may be frequent.
- 6. Fire protection:
  - a. Properly installed firestop systems shall be implemented to prevent or retard the spread of fire, smoke, water, and gases through the building. This requirement applies to openings designed for telecommunications or low-voltage cable use that may or may not be penetrated by cables, wires, or raceways.
  - b. Fire stops shall be installed according to local building code requirements and NFPA.
- C. Equipment Installation:
  - 1. Installation shall include the delivery, unloading, setting in place, fastening to walls, floors, ceilings, counters, or other structures where required, interconnecting wiring of the system components, equipment alignment and adjustments, and all other work whether or not expressly required herein which is necessary to result in complete operational systems.
  - 2. Fastenings and supports shall be adequate to support their weight loads with a safety factor of at least five (5)
  - 3. In the installation of equipment and cable, consideration shall be given not only to operational efficiency, but also to overall aesthetic factors.
  - 4. All equipment shall be firmly secured in place unless requirements of portability dictate otherwise.
  - 5. All equipment shall be secured plumb and square.
- D. Grounding Procedures:
  - 1. The following grounding procedures shall be followed:
    - a. All grounding conductors in that area shall connect to this primary system ground. The system ground shall be provided in the equipment rack for the area. It shall consist of a copper bar of sufficient size to accommodate all secondary ground conductors.
    - b. A copper conductor (No. 4 AWG solid conductor wire, with green insulation, having a maximum of 0.1-Ohms total resistance) shall connect the primary system ground bar. The Contractor shall be responsible for determining if the metallic conduit is electrically bonded properly to the building ground system.
    - c. Secondary system grounding conductors (No. 6 AWG solid conductor wire, with green insulation, with lug attached to rack/cabinet and corresponding ground bar) shall be provided from all racks, cabinets, consoles, cable trays, ladder racks, related conduit, and ungrounded equipment in each area, to the primary system

grounding point for the area. Each of these grounding conductors shall have a maximum of 0.1-Ohms total resistance.

- d. It is acceptable practice to extend a single conductor to adjacent equipment racks in a row, providing one lug at each rack. However, no ground conductor splices at any point between the grounding point and the lug installed at the rack farthest from the grounding point shall be permitted.
- e. Under no conditions shall the AC neutral conductor be used for a system ground, either in the power panel or in a receptacle outlet.
- f. Because of the great number of possible variations in grounding systems, it shall be the responsibility of the Contractor to follow good engineering practice, as outlined above, and to deviate from these practices only when necessary to minimize crosstalk and to maximize signal-to-noise ratios in the system.
- g. All grounding and bonding shall comply with EIA/TIA 607 grounding standards and applicable codes and regulations.

### 3.5 QUALITY CONTROL AND COPPER CABLE TESTING

#### A. Quality Control

- 1. Contractor to procure only new cable and equipment for this project.
- 2. Contractor to ensure that all equipment and cable are free of defects and are protected under respective manufacturer warranties.

#### B. Copper Cable Testing:

- 1. All pre-fabricated cables shall be factory tested for continuity before shipment. Contractor shall submit documentation to prove the cables have been tested by the manufacturer to industry standards.
- 2. Contractor shall provide a thorough testing program for the communications cabling plant including final acceptance testing. Contractor shall provide procedures, a list of test equipment and operating instructions before the tests.
- 3. Subsystems shall be tested individually before testing for end-to-end connectivity. All faults shall be corrected and retested. All test results shall be completely documented by Contractor.
- 4. For all cable that fails manufacturer's or specified testing criteria, the contractor shall correct the problem or replace the cable or defective component at no additional expense to the Owner.
- 5. Contractor shall provide two (2) hard copies and one (1) electronic copy (Microsoft Excel or PDF format) of a summary of results for all cables and equipment tested, including: cable ID, strand ID (for fiber optic cables), cable length, and pass/fail result.
- 6. All test results shall be submitted in a sequential, organized fashion, as per the Specification and/or project schedule.
- 7. The Owner reserves the right to independently test any or all of the cable plant. If more than 3% of the tested cable plant within a floor, system or area fails, the Contractor will be required to take the following actions at no additional cost.
  - a. Reimburse Owner for all costs incurred for independent testing.
  - b. Work overtime to remedy defects and retest entire floor, system, or area, as defined by Owner. This corrective work shall not impact the planned occupancy dates.

#### C. Test Process:

- 1. Owner reserves the right to be present during any or all of testing.
- 2. Testing shall be of the Permanent Link. However, Contractor shall warrant performance based on basic link performance and provide patch cords that meet channel performance.

3. All cabling not tested strictly in accordance with these procedures shall be re-tested at no additional cost to the Owner.
4. 100% of the installed cabling must be tested. All tests must pass acceptance criteria defined below.
5. Test equipment shall be fully charged prior to each days testing.
6. Standards Compliance & Test Requirements
  - a. Copper cabling must meet TIA 568B Category 6A
  - b. All test equipment used must meet the performance specifications defined in paragraph 9 below.
7. Documentation
  - a. Test reports must be submitted in electronic format. Hand-written test reports are not acceptable.
  - b. An attached affidavit verifying passing execution of all tests. For large installations electronic reports are preferred. Summary reports shall contain the following information on each row of the report: circuit ID, test specification used, length, date of test, and pass/fail result.
  - c. Reports must be accompanied by a Certificate signed by an authorized representative of the Contractor warranting the truth and accuracy of the electronic report. Certificate must reference traceable circuit numbers that match the electronic record.
  - d. Test reports shall include the following information for each cabling element tested.
    - 1) Wiremap results that indicate the cabling has no shorts, opens, miswires, split, reversed, or crossed pairs, and end to end connectivity is achieved.
    - 2) For Category 6A cabling tests results shall include the following test results:
      - a) Attenuation, Near End Cross Talk (NEXT)
      - b) Power Sum Alien Next (PSANEXT)
      - c) Power Sum Near End Crosstalk (PSNEXT)
      - d) Insertion Loss (IL)
      - e) Return Loss (RL)
      - f) Attenuation to Cross Talk Ratio -Far End (ACRN)
      - g) Power Sum Attenuation to Cross Talk Ratio - Near End (PSACR-N)
      - h) Power Sum Alien Attenuation to Crosstalk Ratio - From Far End (PSAACRF)
      - i) Far End Crosstalk (FEXT).
      - j) Power Sum Attenuation to Crosstalk Ratio - Far End (PSACRF)
      - k) Length
      - l) Propagation Delay
      - m) Delay Skew
    - 4) Data that indicate the worst case result, the frequency at which it occurs, the limit at that point, and the margin. These tests shall be performed in

a swept frequency manner from 1 MHz to highest relevant frequency, using a swept frequency interval that is consistent with TIA and ISO requirements. Information shall be provided for all pairs or pair combinations and in both directions when required by the appropriate standards. Any individual test that fails the relevant performance specification shall be marked as a FAIL.

- 5) Length (in meters), propagation delay, and delay skew relative to the relevant limit. Any individual test that fails the relevant performance specification shall be marked as a FAIL.
  - 6) Cable manufacturer, cable model number/type, and NVP.
  - 7) Tester manufacturer, model, serial number, hardware version, and software version.
  - 8) Circuit ID number, date and project name.
  - 9) Autotest specification used.
  - 10) Overall pass/fail indication.
8. Test reports shall be submitted within 7 business days of completion of testing and at least (30) days prior to substantial completion.
9. Test Equipment
- a. Contractor will provide an artifact showing tester has been calibrated within one year of the last test result for this project
  1. Test equipment used under this contract shall be from manufacturers that have a minimum of 5 years experience in producing field test equipment. Manufacturers must be ISO 9001 certified.
  - b. All test tools of a given type shall be from the same manufacturer, and have compatible electronic results output.
  - c. Test adapter cables must be approved by the manufacturer of the test equipment. Adapters from other sources are not acceptable.
  - d. Baseline accuracy of the test equipment must exceed TIA Level III, as indicated by independent laboratory testing.
  - e. Test equipment must be capable of certifying Category 5, 5e, and 6A links.
  - f. Test equipment must have a dynamic range of at least 100 dB to minimize measurement uncertainty.
  - g. Test equipment must be capable of storing full frequency sweep data for all tests and printing color graphical reports for all swept measurements.
  - h. Test equipment must include S-Band time domain diagnostics for NEXT and return loss (TDNXT and TDRL) for accurate and efficient troubleshooting.
  - i. Test equipment must be capable of running individual NEXT, return loss, etc measurements in addition to autotests. Individual tests increase productivity when diagnosing faults.
  - j. Test equipment must include a library of cable types, sorted by major manufacturer.
  - k. Test equipment must store at least 1000 Category 6 or 6A autotests in internal memory.
  - l. Test equipment must be able to internally group autotests and cables in project folders for good records management.
  - m. Test equipment must include DSP technology for support of advanced measurements.
  - n. Test equipment must make swept frequency measurements in compliance with

- o. TIA standards.
- o. The measurement reference plane of the test equipment shall start immediately at the output of the test equipment interface connector. There shall not be a time domain dead zone of any distance that excludes any part of the link from the measurement.

### 3.6 QUALITY CONTROL AND FIBER OPTIC CABLE TESTING

#### A. Quality Control

1. Contractor to procure only new cable and equipment for this project.
2. Contractor to ensure that all equipment and cable are free of defects and are protected under respective manufacturer warranties.

B. Test measurements shall be carried out in accordance with the Tier 2 specification of ANSI/TIA-568-C.0, Annex E, plus an image capture of connector end-faces. Tier 2 testing is a higher level of testing that provides qualitative measures of the installed condition and performance of the cabling system and its components. Tier 2 testing includes length measurement, attenuation measurement, verifying polarity (using an optical loss test set (OLTS) and obtaining a trace and event table of the fiber with an optical time domain reflectometer (OTDR). OTDR traces are used to evaluate the installed cabling for anomalies and assuring uniformity of cable attenuation and connector insertion loss.

C. Testing shall be performed on each optical fiber cabling link (adapter to adapter).

D. All tests shall be documented including OLTS dual wavelength attenuation measurements for single-mode links (1310nm and 1550nm), OLTS length measurements for single-mode links, OTDR traces and event tables for single-mode links, and image captures of connector end-faces.

E. All testing procedures and field-test instruments shall comply with applicable requirements of:

ANSI Z136.2, ANSI For Safe Use Of Optical Fiber Communication Systems Utilizing Laser Diode And LED Sources

ANSI/EIA/TIA-455-50B, Light Launch Conditions For Long-Length Graded-Index Optical Fiber Spectral Attenuation Measurements

ANSI/TIA/EIA-455-59A, Measurement of Fiber Point Discontinuities Using an OTDR.

ANSI/TIA/EIA-455-60A, Measurement of Fiber or Cable Length Using an OTDR.

ANSI/TIA/EIA-455-61A, Measurement of Fiber or Cable Attenuation Using an OTDR.

ANSI/TIA/EIA-526-7, Optical Power Loss Measurements of Installed Single-mode Fiber Cable Plant.

ANSI/TIA/EIA-526-14-A, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.

ANSI/TIA -568-C.0, Generic Telecommunications Cabling for Customer Premises.

ANSI/TIA -568-C.3, Optical Fiber Cabling Components Standard.

F. Trained technicians who have successfully attended an optical fiber testing training program, which includes testing with an OLTS and an OTDR and have obtained a certificate as proof thereof shall execute the tests. These certificates may have been issued by any of the following organizations

or an equivalent organization:

1. Manufacturer of the fiber optic cable and/or the fiber optic connectors.
2. Manufacturer of the test equipment used for the field certification.
3. Training organizations (e.g., BICSI, A Telecommunications Association).
4. The Owner or the Owner's representative shall be invited to witness, review or both witness and review field-testing.
5. The Owner or the Owner's representative shall be notified of the testing start date, five (5) business days before testing commences.
6. The Owner or the Owner's representative will select a random sample of 5% of the installed links and test that sample. The measured results obtained from the random sample shall be compared to the data provided by the contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the contractor under supervision of the Owner or Owner's representative shall repeat 100% of the testing at no cost to the Owner.

#### G. SUBMITTALS

1. Manufacturers catalog sheets and specifications for the fiber optic field-test instruments including optical loss test sets (OLTS), optical time domain reflectometer (OTDR) and endface inspection capture device.
2. A schedule (list) of all optical fibers to be tested identified.
3. Sample test reports.
4. Acceptance of test results
5. Link attenuation measurement and allowance calculation
6. The measured link attenuation shall be less than the link attenuation allowance. The link attenuation allowance is calculated as:
  - a.  $\text{Link Attenuation Allowance (dB)} = \text{Cable Attenuation Allowance (dB)} + \text{Connector Insertion Loss Allowance (dB)} + \text{Splice Insertion Loss Allowance (dB)}$
  - b.  $\text{Connector Insertion Loss Allowance (dB)} = \text{Number of Connector Pairs} \times 0.4\text{dB}$
  - c.  $\text{Splice Insertion Loss Allowance (dB)} = \text{Number of Splices} \times 0.15\text{dB}$
  - d.  $\text{Cable Attenuation Allowance (dB)} = \text{Maximum Cable Attenuation Coefficient (dB/km)} \times \text{Length (km)}$

Optical fiber and cable type <sup>2</sup>	Wavelength (nm)	Maximum attenuation (dB/km)
Single-Mode Indoor-Outdoor (OS1) (OS2) <sup>3</sup>	1310 1550	0.5 0.5
Single-Mode Outside Plant (OS1) (OS2) <sup>3</sup>	1310 1550	0.5 0.5

7. All installed cabling links shall be field-tested and pass the link attenuation measurement and allowance calculation and OTDR analysis. Any optical fiber link that fails these requirements shall be diagnosed and corrected. Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected link meets performance requirements. The final and passing result of the tests for all links and channels shall be provided in the test results documentation in accordance with Part 3.
8. Individual connector, splice and fiber insertion loss shall be evaluated using the OTDR trace.

#### H. Optical Fiber Cable Test Equipment



1. The field-test instrument shall be within the calibration period recommended by the manufacturer.
2. The field-test instrument shall contain the most recent software and firmware provided by the manufacturer prior to testing.
3. Optical loss test set (OLTS)
4. The OLTS shall be capable of providing length measurement of the fiber under test.
5. Multimode optical fiber light source
6. Provide dual LED light sources with central wavelengths of 850 nm ( $\pm 30$  nm) and 1300 nm ( $\pm 20$  nm)
7. Output power of -20 dBm minimum.
8. The light source shall meet the launch requirements of ANSI/EIA/TIA-455-50B, Method A. This launch condition can be achieved either within the field test equipment or by use of an external mandrel wrap (see Part 3, 3.2, C, 1, c) with a Category 1 light source.
9. Single-mode optical fiber light source
10. Provide dual laser light sources with central wavelengths of 1310 nm ( $\pm 20$  nm) and 1500 nm ( $\pm 20$  nm).
11. Output power of -10 dB minimum.
12. Power Meter
13. Provide 850nm, 1300nm and 1500nm wavelength test capability.
14. Power measurement uncertainty of  $\pm 0.25$  dB.
15. Store reference power measurement.
16. Save at least 100 results in internal memory.
17. PC interface (serial or USB).
18. Acceptable manufacturers, models:
  - a. Fluke Networks, OptiFiber (OLTS and OTDR combined)
  - b. Fluke Networks, DTX (OLTS; MFM2, SFM2)
  - c. Corning Cabling Systems OTS-613QD (OLTS) Exfo, FOT-600 OLTS (OLTS)
  - d. Approved equivalent

I. Optical Time Domain Reflectometer (OTDR)

1. Shall have a bright, color transmissive LCD display with backlight.
2. Shall have rechargeable Li-Ion battery for 8 hours of normal operation.
3. Internal non-volatile memory and removable memory device with at least 16 MB capacity for results storage.
4. Serial and USB ports to transfer data to a PC.
5. Multimode OTDR
6. Wavelengths of 850 nm ( $\pm 20$  nm) and 1300 nm ( $\pm 20$  nm).
7. Event deadzones typically of 0.5 m at 850 nm and 1.3 m at 1300 nm.
8. Attenuation deadzones 4.5 m at 850 nm and 10.5 m at 1300 nm.
9. Distance range 3 km at 850 nm and 7 km at 1300 nm.
10. Dynamic range 15 dB at 850 nm and 14 dB at 1300 nm.
11. Single-mode OTDR
12. Wavelengths of 1310 nm ( $\pm 25$  nm) and 1550 nm ( $\pm 30$  nm).
13. Event deadzones typically of 1 m at 1310 nm and 1 m at 1550 nm.
14. Attenuation deadzones typically of 8 m at 1310 nm and 8 m at 1550 nm.
15. Distance range at least 60 km.
16. +Dynamic range 26 dB at 1310 nm and 24 dB at 1550 nm.
17. Acceptable manufacturers, models:
  - a. Fluke Networks, OptiFiber (OLTS and OTDR combined with end face image capture)
  - b. Fluke Networks, DTX (QUAD-OTDR)

- c. Corning Cabling Systems, OV-1000 OTDR Exfo, FTB-150 OTDR
    - d. Approved equivalent
- J. Fiber Microscope
  - 1. Magnification of 250X or 400X for end-face inspection
  - 2. Video camera and display showing magnified end-face image.
  - 3. Camera probe tips permitting inspection through adapters.
  - 4. Capable of saving end-face image.
  - 5. Acceptable manufacturers, models:
    - a. Corning Cabling Systems, VIP-CCO-K17
    - b. Fluke Networks, OptiFiber (OLTS and OTDR combined with end face image capture)
    - c. Approved equivalent
- K. Administration
  - 1. The test result information for each link shall be recorded in the memory of the field-test instrument upon completion of the test.
  - 2. The test result records saved within the field-test instrument shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of these test records.
  - 3. All tests performed on optical fiber cabling that use a laser or LED in a test set shall be carried out with safety precautions in accordance with ANSI Z136.2.
  - 4. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to field-testing. Any testing performed on incomplete systems shall be redone on completion of the work.
  - 5. Dust caps shall be placed on fiber endfaces or adapters for each optical fiber link after all testing is complete on the fiber link.
  - 6. Testing shall be performed in accordance with ANSI/TIA-568-C.0 Annex E, Tier 2 testing on each cabling segment (i.e., verify polarity, measuring length, OLTS attenuation measurement, and OTDR trace).
  - 7. In addition to Tier 2 testing of ANSI/TIA-568-C.0 Annex E, an image of each fiber optic connector endface shall be taken, recorded and provided as part of the records.
  - 8. Optical fiber link test results from the OLTS, OTDR and endface image shall be recorded in the memory of the field-test instrument.
  - 9. Each optical fiber test shall be uploaded to a PC in which the administrative documentation (reports) shall be generated.
  - 10. The records for each test shall be provided to the owner a minimum of two weeks prior to substantial completion in Excel format and the native format to the test instrument. The Owner can supply an Excel spreadsheet template upon request for the contractor's use.
- L. Optical Fiber Test
  - 1. Polarity
  - 2. For duplex connector systems, polarity shall be verified. The polarity shall be verified with an OLTS while performing attenuation tests.
  - 3. Length measurement
  - 4. Each optical fiber link shall be measured for its length. The fiber length may be obtained by a capable OLTS or by an OTDR.
  - 5. Attenuation measurement (OLTS)
  - 6. General
    - a. Optical sources shall be turned on for a minimum of 5 minutes prior to referencing.
    - b. Test jumpers shall be reference quality and between 1m and 5m in length.
    - c. Mandrels shall be used when testing attenuation of multimode optical

- fiber cabling with an OLTS.
- d. Where mandrels are used, secure the mandrel to the light source by some means such as a cable tie or tape. Care should be taken to ensure that the fiber jacket is not deformed or damaged when using a cable tie or tape.
  - e. The light source shall be referenced to the meter a minimum of twice daily (i.e., in the morning and noon).
  - f. Fiber test jumpers shall be of the same core size as the cabling under test (e.g., single-mode to single-mode, 62.5µm multimode to 62.5µm multimode, 50µm multimode to 50µm multimode). Additionally the test jumpers shall meet the performance specifications of the fiber under test and that of the test instrument manufacturer.
  - g. Fiber test jumpers shall be cleaned prior to connection to the test instrument. After cleaning, cleaning solutions shall be given sufficient time to evaporate (approximately 30 seconds) prior to the mating of fiber test jumper to the test instrument.
  - h. The end of the fiber test jumper that will connect to the fiber link to be tested, the adapters and fiber under test shall be cleaned immediately prior to each fiber being tested. After cleaning, cleaning solutions shall be given sufficient time to evaporate (approximately 30 seconds) prior to the mating of fiber test jumper to the fiber under test.
  - i. The test jumper connected to the source shall not be removed after referencing so as not to adversely influence the attenuation measurement. Removal and reattachment of the test jumper connection from the source may affect the referenced power level. Re-referencing is to be performed if the test jumper is disconnected from the light source.
  - j. Single-mode optical fiber links shall be tested at 1310 nm and 1550 nm in accordance with ANSI/TIA/EIA-526-7, Method A.1, One Reference Jumper.
  - k. Multimode optical fiber links shall be tested at 850 nm and 1300 nm in accordance with ANSI/TIA/EIA-526-14-A, Method B, One Reference Jumper.
  - l. Multimode and single-mode optical fiber links shall be measured and reported for attenuation in each direction and attenuation bi-directionally (averaged in both directions). The measurements shall be less than or equal to the link attenuation allowance calculation (see Part 1, 1.7, A.).
  - m. Steps to measure and calculate optical fiber link attenuation include a) verifying test jumper quality; b) setting the reference; c) measuring link attenuation; and d) calculating link attenuation.
  - n. This example below describes the process when testing multimode fiber with the test jumper connected to the source having five non-overlapping wraps of multimode fiber on a mandrel. The procedure is also applicable to single-mode cabling, however, the five non-overlapping wraps of multimode fiber would be replaced with a single 30 mm (1.2 in) diameter loop of single-mode fiber.
  - o. Verifying test jumper quality
  - p. Test jumpers shall be tested for quality prior to use as a test jumper. See example below.
  - q. To verify that the test jumpers are in acceptable condition, first reference the light source to the optical power meter  
(see: <http://www.thefoa.org/tech/ref/1pstandards/FOA-3.pdf> )  
Disconnect test jumper (J1) from the power meter (only) and insert a second test jumper (J2) by connecting it to the power meter and to (J1) with a mating adapter (see:

M. OTDR Trace

<http://www.thefta.org/tech/ref/1pstandards/FOA-4.pdf> ) and record the measurement. Disconnect both ends of J2, interchange the ends, and reconnect it and record the measurement. The resulting measurements,  $P_{verify}$ , should be within the appropriate connector loss specification. For example, if the connector used is specified at 0.32 dB, the reading on the power meter should be within 0.32 dB of  $P_1$ .

1. An OTDR trace shall be taken of each optical fiber link in one direction to ensure uniformity of cable attenuation and connector insertion loss. Multimode fiber traces shall be taken at 850nm and 1300nm. Single-mode fiber traces shall be taken at 1310nm and 1550nm.
2. A launch cable to the length specified by the manufacturer of the OTDR shall be installed between the OTDR and the first link connection. The launch cable shall be of the same fiber type as the link under test.
3. A receive cable shall be installed after the last link connection to be part of the OTDR trace. The receive cable shall be at least 100m (328ft) in length and of the same fiber type as the link under test.
4. Selectable parameters affecting the OTDR measurement may include the test source wavelength, pulse duration or signal strength, length range, backscatter coefficient, signal averaging (time or count) and the group index of the fiber (also known as the index of refraction or the refractive index). The display shall be adjusted to view the region of interest on the trace on both the horizontal and vertical axes.

N. Administration

1. Test results documentation
2. Test results saved within the field-test instrument shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of the test records. These test records shall be uploaded to the PC unaltered, i.e., "as saved in the field-test instrument".
3. The test results documentation shall be available for inspection by the Owner or the Owner's representative during the installation period. The contractor shall retain a copy to aid preparation of as-built information.
4. The records for each test shall be provided to the owner a minimum of two weeks prior to substantial completion in Excel format and the native format to the test instrument. The Owner can supply an Excel spreadsheet template upon request for the contractors use.
5. Circuit IDs reported by the field-test instrument shall match the label ID specified by the Owner.
6. The detailed test results documentation data is to be provided in an electronic database for each tested optical fiber and shall contain the following information
7. The identification of the customer site as specified by the end-user
8. The name of the standard selected to execute the stored test results
9. The name of the test personnel
10. The date and time the test results were saved in the memory of the tester
11. The manufacturer, model and serial number of the field-test instrument
12. The version of the test software and the version of the test standards database held within the test instrument
13. The value of the 'index of refraction' used for length calculations
14. The fiber identification number
15. The length for each optical fiber calculated by the OLTS.
16. Test results to include OLTS attenuation link and channel measurements at 850 nm and 1300 nm for multimode cabling, and at 1310 nm and 1550 nm for single-mode cabling and the margin (difference between the measured attenuation and the test limit value).
17. Test results shall be submitted to include OTDR link and channel traces and event tables at 850 nm and 1300 nm for multimode cabling, and at 1310 nm and 1550 nm for single-

mode cabling and the margin (difference between the measured attenuation and the test limit value).

18. The length for each optical fiber calculated by the OTDR.
19. The overall Pass/Fail evaluation of the link-under-test for OLTS and OTDR measurements
20. A picture or image of each fiber end-face

O. Cable Labeling and Site As-Built Documentation

1. Post in prominent location in communications each equipment room a list of 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.
2. Show building floor plans with cabling and port labeling. Identify labeling convention and show labels for telecommunications closets, hardware, horizontal cables, work areas, grounding buses and pathways, and equipment grounding conductors.
3. Follow convention of ANSI/TIA/EIA-606-A or as indicated or directed in writing by the designated representative of the Owner.
4. Label each horizontal and backbone cable within 4 inches of each termination, where it is accessible in a rack, cabinet, junction box or outlet box.
5. For labeling of Patch Panels coordinate with Owner for labeling scheme. Label each connector, faceplate with computer-printed type with printing area and font color.

3.6 PRE-INSTALLATION INSPECTION

- A. Visually inspect all cables, cable reels, and shipping cartons to detect possible cable damage incurred during shipping and transport. Visibly damaged goods are to be returned to the supplier and replaced at no additional cost to the Vendor.
- B. If post-manufacture performance data has been supplied by the manufacturer of cables or connecting hardware, copies of such data are to be kept for inclusion in the Documentation and made available to the Owner or Architect upon request.
- C. All materials are to be new and unused.

3.7 FINAL ACCEPTANCE

A. Acceptance

1. Once all work has been completed, test documentation has been submitted, and Owner, Architect and Consultant is satisfied that all work is in accordance with contract documents, Contractor shall be notified in writing of formal acceptance of the system.
2. Acceptance Requirements
  - a. Contractor must warrant in writing that 100% of the installation meets the requirements specified under Part 2, section 3 (Standards Compliance & Test Requirements) above.

- B. Contractor shall warrant Installation against all product defects for a period of 30 years.

3.8 WORKMANSHIP

- A. The installation of all work shall be neat. All boxes, equipment, etc., shall be plumb and square.
- B. The Contractor shall keep the job adequately staffed at all times. Unless illness, loss of personnel, or other circumstances beyond the control of Contractor intervene, he shall keep the

same individual in charge throughout its execution.

- C. Following installation, all soiled, abraded or discolored surfaces of work installed herein will be cleaned and left free from blemishes or defects.
- D. Work that is damaged or improperly installed will be removed and replaced and the entire installation left in complete satisfactory condition.
- E. Clean the areas affected by the Work to a level of operational cleanliness, vacuum clean, and wipe down all metal and plastic surfaces to remove any construction dust..
- F. The Contractor shall remove from the job site all rubbish and refuse at the end of each day and shall keep his work area clean.
- G. Any damage brought about by Contractor's work shall be repaired by the Contractor at no cost to the Owner.
- H. It shall be the responsibility of the Contractor to cooperate with other trades in order to achieve well-coordinated progress and satisfactory final results. He shall watch for conflicts with work of other contractors on the job and execute, without claim for extra payment, moderate moves or changes as are necessary to accommodate other equipment or preserve symmetry and pleasing appearance.
- J. For duration of installation and warranty period, service calls must be responded to within two hours of request, by arrival of technicians and equipment to the project site.

END OF SECTION 271000

## **SECTION 283105 - FIRE ALARM SYSTEM EQUIPMENT**

### **PART 1 - GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Fire alarm initiating devices.
- B. Fire alarm notification appliances.
- C. Peripheral fire alarm equipment.
- D. Wire and conduit.

#### **1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract apply to this section.

#### **1.03 REFERENCES**

- A. NFPA 70 - National Electrical Code.
- B. NFPA 72 - National Fire Alarm Code.
- C. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.

#### **1.04 SUBMITTALS**

- A. Product Data: Material and equipment information including manufacturer's catalog data sheets and pertinent technical data for each component or device used on the system, including, but not limited to, the following:
  - 1. All initiating devices.
  - 2. All notification appliances.
  - 3. All peripheral fire alarm equipment.
- C. Shop Drawings:
  - 1. Sufficient information, clearly presented, to determine compliance with drawings and specifications.

CONTRACTOR RESPONSIBILITY CHART					
MATERIAL	PROVIDED BY	INSTALLED BY	LOW-VOLTAGE WIRING BY	BACKBOX & CONDUIT BY	PROGRAMMING/HEAD END TERMINATIONS/TESTING BY
DATA AND TELEPHONE JACKS, CAT6 CABLING, FIBER OPTIC CABLE, FACEPLATES, RACKS AND PATCH PANELS	●	●	●	●	●
TELEPHONES	☐	☐	—	●	☐
CARD ACCESS	☐	●	●	●	☐
SECURITY CCTV CAMERAS	☐	●	●	●	☐
DOOR HARDWARE (LATCH RETRACTION, STRIKES, POWER SUPPLIES, ECT.)	●	●	●	●	☐
AUDIO VISUAL SYSTEMS (PROJECTORS, MOUNTS, PROJECTION SCREENS, DISPLAY MOUNTS, ECT.)	☐	☐	☐	●	☐
POWER & LIGHTING	●	●	●	●	●
FIRE ALARM	●	●	●	●	●
WIFI & WIRELESS ACCESS POINTS	☐	●	●	●	☐
NVR & SWITCHES	☐	☐	☐	☐	☐
LEGEND					
ROWAN UNIVERSITY ☐					
GENERAL CONTRACTOR ●					



2. Include manufacturer's name, model numbers, ratings, power requirements, equipment layout, device arrangement, complete point-to-point wiring diagrams, and conduit layout.
3. Include complete sequence of operation for all control functions provided by the existing Siemens fire alarm control panel.
4. Show annunciator layout, configuration, and terminations.
5. Provide calculations to support the size of standby batteries, power supply capacities, and voltage drop.
6. Large scale drawings of all panels and annunciators.
7. Floor plans showing all system components and circuits.
8. Current UL listing and card indicating the listing of the equipment as a unified system.
9. Other information as may be required for local jurisdiction permit or certification.

D. Manufacturer's Installation Instructions:

1. Submit simultaneously with shop drawings, complete programming, operating and maintenance manual.
2. Indicate application conditions and limitations of use stipulated by product testing agency.

## **1.05 PROJECT RECORD DOCUMENTS**

- A. Record actual locations of all initiating devices, notification appliance, and end-of-line devices.
- B. Record actual wiring terminations.

## **1.06 OPERATION AND MAINTENANCE DATA**

- A. Provide operating instructions and maintenance procedures.

## **1.07 QUALITY ASSURANCE**

A. Manufacturer's Qualifications:

1. Company specializing in manufacturing the products specified in this section for at least ten years.

2. Name of manufacturer, part number, and serial number shall appear on all major components.
3. All devices, components, and equipment shall be the products of a single manufacturer.
4. All devices, components, and equipment shall be new and standard products of the manufacturer's latest design, suitable to perform the functions intended.

**B. Installer's Qualifications:**

1. Firm regularly engaged in installation of systems similar to those specified in this section with five years minimum experience in design, installation, testing, and service of fire detection and control systems.
2. Trained and certified by the manufacturer to design, install, test, and service the fire detection and control system provided under this section.
3. Employ a NICET certified fire alarm system designer, level 2 or above, who will be responsible for this project.
4. Show evidence of a minimum two million dollar liability and completed operations insurance policy. These limits supersede limits required elsewhere in this specification.
5. Provide proof of emergency service available 24 hours a day, seven days a week.

**1.08 WARRANTY**

- A. Guarantee all components furnished against defects in design, material, and workmanship for a period no less than five years.
- B. Provide documented proof of a service contract by an authorized service contractor covering the full warranty period upon acceptance of the installation.

**1.09 MAINTENANCE SERVICE**

- A. Furnish service and maintenance of the fire alarm system for a period of one year from the Date of Substantial Completion.
- B. Include all labor and material required to maintain the system in this contract. Any perishable item supplied, such as batteries, shall be exempt from this requirement if indicated in the submitted documents.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

A. Acceptable Manufacturers:

1. All devices and installation shall be compatible with the existing Siemens fire alarm system.

### **2.02 FIRE ALARM INITIATING DEVICES**

A. Analog Smoke Sensors (Photo-electric Type):

1. Each sensor shall store the sensor address and operating characteristics in non-volatile memory at the sensor. Sensor shall use a threshold received from the control unit to determine when an alarm condition exists.
2. Each sensor shall have two alarm LED's for 360 degree viewing. The alarm LED's shall flash when communicating with the control panel and shall illuminate steady during alarm conditions.
3. Sensitivity settings for photoelectric sensors shall be set and displayed on the LCD in percent obscuration per foot.
4. Each sensor shall be capable of compensating for dust and dirt accumulation within the sensing chamber.
5. A calibrated light source shall be used to calibrate the fire level of the photoelectric sensor. Sensors which use a fixed fire level limit are not acceptable.
6. Provide addressable bases as required.
7. The sensors shall be listed for both ceiling and wall mount application.
8. The sensors shall have test switch for easy alarm testing at the sensor location.

B. Smoke Sensors (Photo-electric Duct Type):

1. The addressable duct smoke sensor shall be of the solid state photoelectric type and shall operate on the light scattering photodiode principle.
2. Provide duct sensor housing as required.

3. Provide proper length of sampling tubes respective to the duct size in which the sensor is being installed.
4. Provide remote alarm LEDs.
5. Duct detectors shall be provided with programmable auxiliary relays so as to provide for unit control.
6. Provide addressable bases as required.
7. The sensors shall have test switch for easy alarm testing at the sensor location.
8. Duct detectors shall be supplied and wired by the electrical contractor, but turned over to the mechanical contractor for installation.

C. Analog Ionization Sensors:

1. Each sensor shall store the sensor address and operating characteristics in non-volatile memory at the sensor; sensor shall use a threshold received from the control unit to determine when an alarm condition exists.
2. Each sensor shall have two alarm LED's for 360 degree viewing. The alarm LED's shall flash when communicating with the control panel and shall illuminate steady during alarm conditions.
3. Each sensor shall be capable of compensating for dust and dirt accumulation within the sensing chamber.
4. Provide addressable bases as required.
5. The sensors shall be listed for both ceiling and wall mount application.
6. The sensors shall have test switch for easy alarm testing at the sensor location.

D. Analog Thermal Sensors:

1. Each sensor shall store the sensor address and operating characteristics in non-volatile memory at the sensor; sensor shall use a threshold received from the control unit to determine when an alarm condition exists.
2. Each sensor shall have two alarm LED's for 360 degree viewing. The alarm LED's shall flash when communicating with the control panel and shall illuminate steady during alarm conditions.

3. Sensitivity settings for thermal sensors shall be set and displayed on the LCD in degrees Fahrenheit. The set point for the thermal sensor shall be adjustable between 100 degrees and 156 degrees F. The thermal detector shall operate on a fixed temperature principle.
  4. Provide addressable bases as required.
  5. The sensors shall be listed for both ceiling and wall mount application.
  6. The sensors shall have test switch for easy alarm testing at the sensor location.
- E. Fixed Temperature/Rate of Rise Heat Sensor:
1. Combination fixed temperature/rate-of-rise heat sensor shall have a low mass thermistor heat sensor and operate at a fixed temperature and at a temperature rate-of-rise.
  2. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm.
  3. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable.
  4. The sensor shall have a nominal fixed temperature alarm point rating adjustable between 100 degrees F and 156 degrees F, and a rate-of-rise alarm point of 15 degrees F per minute.
  5. Provide addressable bases as required.
  6. The sensor shall be listed for ceiling installation and for wall mount applications.
  7. The sensors shall have test switch for easy alarm testing at the sensor location.
- F. Addressable Manual Pull Station:
1. Addressable pull station will contain electronics that communicate the station's status (alarm, normal) to the transponder over two wires which also provide power to the pull station. The address will be set on the station; they will be manufactured from a high impact red Lexan. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common to all system locks. Pull stations will be single action.

2. The front of the station is to be hinged to a backplate assembly and must be opened with a key to reset that station. The key shall be common with the control panels. Stations which use Allen wrenches or special tools to reset will not be accepted. The station shall consist of high impact Lexan plastic, red in color.
3. The addressable manual station shall be capable of field programming of its "address" location on an addressable initiating circuit. The manual station shall be fitted with screw terminals for field wire attachment.
4. Furnish covers where shown to prevent vandalism.

## **2.03 PERIPHERAL FIRE ALARM EQUIPMENT**

### **A. Monitor Module:**

1. Monitor modules shall provide monitoring of dry contacts as initiating devices.
2. Each module shall store the sensor address and operating characteristics in non-volatile memory at the module.
3. Mount module to a standard junction box and provide visual indication of status via a status LED. Optional mounting shall be available to allowing mounting the module in a junction box with a monitored contact.
4. The module shall support the following circuit types: water flow switch, tamper switch, pressure switch, dry contacts of any system, such as preaction system, etc.
5. Water flow and sprinkler tamper switches shall be furnished and installed by the plumbing contractor, but shall be wired into the fire alarm system by the electrical contractor.

### **B. Control Module:**

1. Each control module shall be rated to operate listed notification appliances.
2. Circuit shall be rated for 2.0 amps at 24 VDC.
3. Each control module shall store the sensor address and operating characteristics in non-volatile memory at the module.
4. Each module shall be individually selectable for silencing and walktest. A module programmed to operate during walktest will initiate the programmed pattern for 4 seconds when the appropriate initiating conditions are satisfied.

5. Each control module shall be supervised.
6. Where control module needs to be connected to 120V circuits, provide interposing relay module. The relay shall be powered from the fire alarm system and shall be supervised.
7. Control module shall be used for control of elevator recall, fan shutdown, smoke damper closing, power shutdown, etc. Fan shutdown contact shall be wired to shutdown fans when running in both 'Hand' and 'Auto' modes.

C. Magnetic Door Holders:

1. Magnetic door holder shall be rated 24 VDC. Door holders shall have an approximate holding force of 50 pounds. Equipment supplier shall coordinate with the hardware manufacturer to insure that the door hardware and door holders will work together and function as intended.

## **2.04 NOTIFICATION APPLIANCES**

A. Strobes:

1. Strobes shall be low profile type. The strobes shall be wall mounted type. In and out screw terminals shall be provided for wiring. Strobes shall provide synchronized flash outputs. Strobe output shall be determined as required by its specific location and application from a family of 15 cd, 30 cd, 60 cd, 75 cd, or 110 cd devices.

B. Combination Horn/Strobes:

1. The combination horn-strobe shall be low profile type. They shall be wall mounted type. The horn/strobe shall provide an audible output of 84 dBA at 10 ft. when measured in reverberation room per UL 464. Strobes shall provide synchronized flash outputs. The strobe output shall be determined as required by its specific location and application from a family of 15 cd, 30 cd, 60 cd, 75 cd, or 100 cd devices. The horn shall have a selectable steady or synchronized temporal output. In and out screw terminals shall be provided for wiring. Where called for on the drawings, provide combination chime/strobe in lieu of combination horn/strobe.

C. Power Boosters:

1. Provide power boosters wherever required in the system to serve the notification appliances.

## **2.05 WIRE AND CONDUIT**

A. Wire:

1. All fire alarm system wiring shall be new.
2. Wiring shall comply with local, state, and national codes and as recommended by the manufacturer. Number and size of conductors shall be as recommended by the manufacturer, but shall be not less than 16 AWG for initiating device and signaling line circuits, and 14 AWG for notification appliance circuits.
3. All wiring and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. All field wiring shall be supervised for open circuits, short circuits, and grounded conditions.
5. All wiring shall be plenum rated, unless entirely installed in raceway.

B. Conduit:

1. Install conduit in accordance with the National Electrical Code, NFPA 70.
2. Install all wiring in a conduit or raceway [unless wiring is above accessible suspended ceiling or in hollow drywall partitions]. Conduit fill shall not exceed 40 percent of the interior cross sectional area where three or more cables are included within a single conduit.
3. Separate cables from any open conductors of Class 1 circuits and do not place in any conduit, junction box, or raceway containing Class 1 cables.
4. Wiring for low voltage control, alarm notification, emergency communication, and similar power-limited auxiliary functions may be installed in the same conduit as initiating and signaling line circuits. Design system to permit simultaneous operation of all circuits without interference or loss of signals.
5. Conduits shall not enter the control panel or any other component provided except where entry is specified by the manufacturer.
6. Conduit shall be 1/2 inch minimum.

- C. Control Panel: Connected to a separate dedicated branch circuit with a separate dedicated over current device (circuit breaker or fused disconnect switch); circuit labeled FIRE ALARM.



## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with requirements of NFPA 70, NFPA 72, and applicable local codes.
- B. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturer's wiring diagram. The contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation. All wiring shall be of the type recommended by the manufacturer, approved by the local Fire Department, and shall be installed in rigid, threaded conduit throughout.
- C. All penetration of floor slabs and fire walls shall be firestopped in accordance with all local fire codes.
- D. End of line resistors shall be furnished as required for mounting as directed by the manufacturer.
- E. All wiring shall be color coded throughout, to National Electrical Code standards.

### **3.02 FIELD QUALITY CONTROL**

- A. The system shall be installed and fully tested under the supervision of a trained manufacturer's representative. The system shall be demonstrated to perform all of the functions as specified.

### **3.03 TESTS**

- A. Reports of any field testing during installation shall be forwarded to the Engineer.
- B. Each individual system operation on a circuit by circuit basis shall be tested for its complete operation. The procedure for testing the entire fire alarm system shall be set forth with the consent of the code enforcement official, the Engineer, and the manufacturer. Final testing shall comply with NFPA 72. A letter of certification shall be sent to the Owner's Representative that the entire system has been fully tested to this standard.

### **3.04 DOCUMENTATION AND TRAINING**

- A. The contractor shall compile and provide to the Owner three complete manuals on the completed system to include operating and maintenance instructions, catalog cuts of all equipment and components, as-built wiring diagrams and a manufacturer's suggested spare parts list.
- B. In addition to the above manuals, the contractor shall provide the services of the manufacturer's trained representative for a period of four hours to instruct the Owner's designated personnel on the operation and maintenance of the entire system.

**END OF SECTION 283105**