



## **PROJECT MANUAL**

**CENTRAL MICHIGAN UNIVERSITY  
MOUNT PLEASANT, MICHIGAN**

**CMURC / RRIP-IT RENOVATION  
MOUNT PLEASANT, MICHIGAN**

**BIDS AND CONSTRUCTION SET**

**APRIL 28, 2023**

**PROJECT NO. 2022081  
EDA AWARD NO. 06-01-06375**

**ARCHITECT:**

**NEUMANN / SMITH ARCHITECTURE**

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PROJECT	CMURC / RRIP-IT RENOVATION MOUNT PLEASANT, MICHIGAN
OWNER	CENTRAL MICHIGAN UNIVERSITY MOUNT PLEASANT, MICHIGAN 48559
ARCHITECT	NEUMANN / SMITH ARCHITECTURE 400 GALLERIA OFFICENTRE; SUITE 555 SOUTHFIELD, MICHIGAN 48034
STRUCTURAL ENGINEER	RESURGET ENGINEERING 4219 WOODWARD AVENUE; SUITE 306 DETROIT, MICHIGAN 48201
MECHANICAL/ ELECTRICAL/ PLUMBING ENGINEER	PETER BASSO ASSOCIATES, INC. 5145 LIVERNOIS; SUITE 100 TROY, MICHIGAN 48098

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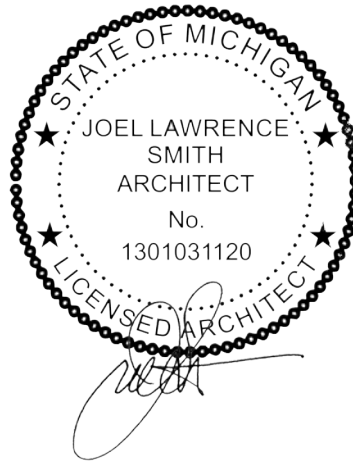
**SECTION 00 0107 - SEALS PAGE**

**PART 1 - GENERAL**

**1.01 ARCHITECTURAL**

I hereby certify this plan, specification, or report was prepared by myself or under my direct supervision and I am a duly Registered Architect under the laws of the State of Michigan.

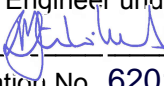
Date 04-27-2023 Registration No. 1301031120



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## 1.02 STRUCTURAL

I hereby certify this plan, specification, or report was prepared by myself or under my direct supervision and I am a duly Registered Engineer under the laws of the State of Michigan.

Marc Steinhobel, PE   
Date 04/27/2023 Registration No. 6201051104  
Marc Steinhobel, PE



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**MECHANICAL**

I hereby certify this plan, specification, or report was prepared by myself or under my direct supervision and I am a duly Registered Engineer under the laws of the State of Michigan.

Date 04-27-2023 Registration No. 6201036881

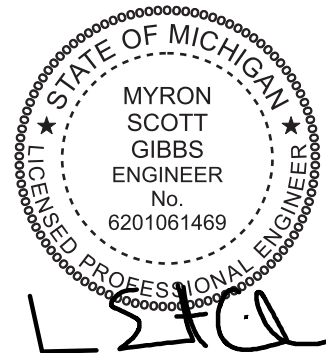


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**ELECTRICAL**

I hereby certify this plan, specification, or report was prepared by myself or under my direct supervision and I am a duly Registered Engineer under the laws of the State of Michigan.

Date 04-27-2023 Registration No. 6201061469



**PART 2 - PRODUCTS (NOT APPLICABLE)**  
**PART 3 - EXECUTION (NOT APPLICABLE)**  
**END OF SECTION**

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<b>Bids and Construction Set April 28, 2023</b>			
	<b>Firm</b>	<b>Section</b>	<b>Title</b>
		<b>Division 00 – Procurement and Contracting</b>	
X	N/S	00 0101	Project Title Sheet
X	N/S	00 0107	Seals Page
X	N/S	00 0110	Table of Contents
X	CMU	00 1000	Invitation To Bid And Bid Instructions
X	N/S		Substitution Request Form
X	CMU		U.S EDA Contracting Provisions (OMB: 0610-0096)
X	CMU	00 2000	Project Manual Table of Contents
X	CMU	00 4100	Bid Form
X	CMU	00 4100.10	Supplement A – List of Alternates
X	CMU	00 5000	Form of Agreement – AIA Document A101 – 2017, A101-2017 Exhibit A
X	CMU	00 7000	General Conditions – AIA Document A201 – 2017
X	CMU	00 9000	Davis Bacon Wage Rates
X	CMU		Form CD-512 - Certification Regarding Lobbying Lower Tier Covered Transactions
X	CMU		Notice of Requirements for Affirmative Action (Executive Order 11246 and 41 CFR Part 60-4)
		<b>Division 01 – General Requirements</b>	
X	CMU	01 1000	Summary
X	N/S	01 2300	Alternates
X	CMU	01 3000	Administrative Requirements
X	N/S		Authorization for Release of Electronic File Transfer
X	CMU	01 4000	Quality Requirements
X	N/S	01 4216	Definitions
X	CMU	01 5000	Temporary Facilities and Controls
X	CMU		EDA Site Sign (OMB: 0610-0096)
X	N/S	01 7329	Cutting and Patching
X	N/S	01 7700	Closeout Procedures
		<b>Division 02 – Existing Conditions</b>	
X	N/S	02 4119	Selective Structure Demolition
		<b>Division 03 and 04 - Not Used</b>	
		<b>Division 05 - Metals</b>	
X	RES	05 1200	Structural Steel Framing
X	RES	05 4000	Cold-Formed Metal Framing
		<b>Division 06 – Wood, Plastics, and Composites</b>	
X	N/S	06 1000	Rough Carpentry
X	N/S	06 4023	Interior Architectural Woodwork
		<b>Division 07 – Thermal and Moisture Protection</b>	
X	N/S	07 8400	Firestopping
X	N/S	07 9200	Joint Sealants

<b>Bids and Construction Set April 28, 2023</b>			
	Firm	Section	Title
		<b>Division 08 - Openings</b>	
X	N/S	08 0671	Door Hardware Schedule
X	N/S	08 1113	Hollow Metal Doors and Frames
X	N/S	08 1416	Flush Wood Doors
X	N/S	08 7100	Door Hardware
X	N/S	08 8000	Glazing
X	N/S	08 8300	Mirrors
		<b>Divisions 09 - Finishes</b>	
X	N/S	09 2116	Gypsum Board Assemblies
X	N/S	09 3000	Tiling
X	N/S	09 5100	Acoustical Ceilings
X	N/S	09 6500	Resilient Flooring
X	N/S	09 6813	Tile Carpeting
X	N/S	09 6900	Access Flooring
X	N/S	09 8430	Sound-Absorbing Wall and Ceiling Units
X	N/S	09 9100	Painting
		<b>Divisions 10 - Specialties</b>	
X	N/S	10 1443	Interior Signage
X	N/S	10 2113.19	Plastic Toilet Compartments
X	N/S	10 2219	Demountable Partitions
X	N/S	10 2241	Operable Glass Partitions
X	N/S	10 2800	Toilet Accessories
		<b>Division 11 Through 19 - Not Used</b>	
		<b>Division 20 - Mechanical</b>	
X	PBA	20 0500	Mechanical General Requirements
X	PBA	20 0510	Basic Mechanical Materials and Methods
X	PBA	20 0529	Hangers and Supports
X	PBA	20 0553	Mechanical Identification
X	PBA	20 0700	Mechanical Insulation
		<b>Division 21 - Fire Suppression</b>	
X	PBA	21 1100	Fire-Suppression System
		<b>Division 22 - Plumbing</b>	
X	PBA	22 0523	General Duty Valves for Plumbing
X	PBA	22 1116	Domestic Water Piping
X	PBA	22 1316	Sanitary Waste and Vent Piping
X	PBA	22 4200	Plumbing Fixtures
		<b>Division 23 - Heating, Plumbing, and Air-Conditioning (HVAC)</b>	
X	PBA	23 0500	Common Work Results for HVAC
X	PBA	23 0593	Testing, Adjusting, and Balancing

<b>Bids and Construction Set April 28, 2023</b>			
	Firm	Section	Title
X	PBA	23 3113	Metal Ducts
X	PBA	23 3116	Non-Metal Ducts
X	PBA	23 3300	Duct Accessories
X	PBA	23 3713	Diffusers, Registers, and Grilles
		<b>Division 24 and 25 – Not Used</b>	
		<b>Division 26 - Electrical</b>	
X	PBA	26 0010	Electrical General Requirements
X	PBA	26 0519	Conductors and Cables
X	PBA	26 0526	Grounding and Bonding
X	PBA	26 0529	Hangers and Supports for Electrical Systems
X	PBA	26 0533	Raceways and Boxes
X	PBA	26 0553	Electrical Identification
X	PBA	26 0923	Lighting Control Devices
X	PBA	26 0943	Lighting Control Systems
X	PBA	26 2416	Panelboards
X	PBA	26 2726	Wiring Devices
X	PBA	26 2816	Enclosed Switches and Circuit Breakers
X	PBA	26 5119	LED Interior Lighting
X	PBA	26 5700	Luminaire Product Data
		<b>Division 27 - Communications - Not Used</b>	
		<b>Division 28 - Electronic Safety</b>	
X	PBA	28 3100	Fire Alarm
		<b>Division 29 Through 49 – Not Used</b>	

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# **CMURC Rural Rescue Impact Plan – Isabella Transformation (RRIP-IT)**

**Award #: 06-01-06375    URI: 117640**

## **Request for Proposal For Construction Services**

### **Bidding Schedule:**

<b>Issue for Bid:</b>	<b>May 23, 2023</b>
<b>Mandatory Pre-Bid Meeting</b>	<b>June 6, 2023 @ 1:00PM</b>
<b>Bid Due Date:</b>	<b>June 22, 2023, 2:30 PM</b>
<b>Projected Award Date:</b>	<b>Week of July 24, 2023</b>

### **Engineering Contact:**

<b>Central Michigan University</b>	
Philip A. Tanner	(989) 774 - 1910
Project Manager	<a href="mailto:tanne1p@cmich.edu">tanne1p@cmich.edu</a>
Central Michigan University	Cell: 989-860-9845
CSB 213	
Mount Pleasant, Michigan 48859	

<b>Neumann/Smith Architecture</b>	
Philip Herriges, RA	(248) 352-8310 (Office)
Project Manager	Neumannsmith.com
400 Galleria Officentre / Suite 555	Cell: 248-756-9981
Southfield, Michigan 48034	
Email Address: <a href="mailto:pherriges@neumannsmith.com">pherriges@neumannsmith.com</a>	

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## SECTION 00 1000 – INVITATION TO BID AND BID INSTRUCTIONS

### PROJECT: CMURC Rural Rescue Impact Plan – Isabella Transformation (RRIP-IT)

#### The Owner (hereinafter referred to as Owner):

Central Michigan University  
University Engineering & Planning Department  
Combined Services Building 206  
Mt. Pleasant, Michigan 48859

#### And the Architect (hereinafter referred to as Architect or A/E):

**Neumann/Smith Architecture**  
400 Galleria Officentre / Suite 555  
Southfield, Michigan 48034  
Attn: Stan Cole

#### 1. ISSUE DATE: May 23, 2023

#### 2. PRE-BID MEETING

- a. A mandatory pre-bid meeting will be held on **June 6, 2023, at 1:00 PM** EST at Central Energy Facility 123 conference room on CMU's Mount Pleasant campus. (1730 East Campus Dr., Mt. Pleasant, MI 48859) Representatives of the Architect and Owner will be in attendance. Information relevant to the Bid Documents may be recorded in an Addendum, issued to Bid Document recipients.
- b. Please reply to this invitation prior to the pre-bid meeting with your intent to submit a bid via email to the CMU Project Manager.

#### 3. BID PROPOSAL DUE DATE / LOCATION

- a. Sealed proposals will be received at the CMU Combined Services Building 206 in Mount Pleasant on **June 22, 2023 by 2:30 PM EST**.  
1720 East Campus Drive  
Combined Services Building 206  
Mount Pleasant, MI 48859

#### 4. BID DOCUMENT AVAILABILITY

- a. Bid documents, drawings and specifications are available at the following:
  - i. **Central Michigan University, University Engineering & Planning Website:**  
<https://www.cmich.edu/offices-departments/finance-administrative-services/facilities-management/university-engineering-and-planning>
  - ii. **Neumann/Smith Architecture**  
400 Galleria Officentre / Suite 555  
Southfield, Michigan 48034  
P: 248.352.8310  
Philip Herriges, RA  
Cell: 248-756-9981
  - iii. **The Following Plan Rooms:**
    - (1) **Builders Exchange of Grand Rapids & Western Michigan** 678 Front Ave. NW, Suite 330, Grand Rapids, MI 49504, P:(616) 949-8650, E: [projects@grbx.com](mailto:projects@grbx.com).

- (2) **Builders Exchange of the Kalamazoo Area** 3431 E. Kilgore, Kalamazoo, MI 49001-5513, P: (269) 349-2507, F: (269) 349 – 9306, Contact: Pam Carey, E: [Michelle@builder-exchange.com](mailto:Michelle@builder-exchange.com)
  - (3) **Builders Exchange of Lansing & Central Michigan** 1240 E. Saginaw St., Lansing, MI 48906, P: (517) 372 – 8930, Contact: Leslie Vargas, E: [bids@bxlansing.com](mailto:bids@bxlansing.com).
  - (4) **Builders Exchange of Northwest Michigan** Traverse City, MI., 1373 Barlow Street, STE #4, Traverse City, MI 49686, P: (231) 946 – 5531, F: (231) 947 – 5344, Contact: Ann Kelly, E: [info@bxtvc.com](mailto:info@bxtvc.com).
  - (5) **Construction Association of Michigan** 43636 Woodward Ave., Bloomfield Hills, MI 48302, P: (248) 972 – 1000, Contact: Suzie Cesonia, E: Editor@buildwithcam.com
- Central Michigan Plan Room** 2026 Independence Drive, Ste. B, Mt. Pleasant, MI 48858, P: (989) 775 – 7747, F: (989) 775 – 7748, Contact: Carmelina Crisci, E: [carmi@hbacm.com](mailto:carmi@hbacm.com)

5. **Bidders** are required to be pre-qualified by Central Michigan University prior to bid submission date and time. Pre-qualification form is enclosed with this invitation. Please submit completed pre-qualification form to Phil Tanner, CMU Project Manager at [tanne1p@cmich.edu](mailto:tanne1p@cmich.edu).

**6. SCHEDULE:**

- a. Invitation to Bid Published: May 23, 2023
- b. Bid Documents Available: May 23, 2023
- c. Mandatory Pre-Bid Meeting: June 6, 2023, @ 1:00 PM EST
- d. RFI Cut-Off: June 15, 2023 @ 2:30 PM EST
- e. Bid Due Date: June 22, 2023 @ 2:30 PM EST
- f. Post Bid Interviews: June 26 – June 28, 2023
- g. Award Contracts: Week of July 24, 2023
- h. Construction Starts: July 31, 2023
- i. Substantial Completion: December 2, 2024
- j. Liquidated Damaged Start: December 3, 2024

**7. PROJECT SUMMARY:**

- A. Your firm is invited to submit an offer to the Owner for the Central Michigan University Research Corporation (CMURC) Rural Rescue Impact Plan – Isabella Transformation (RRIP-IT) project as described in this Request for Proposal (RFP) and the attached AIA Document A101-2017 and AIA A201-2017 General Conditions, as amended by Central Michigan University (CMU).
- B. This is a construction project supported through the Public Works and Economic Adjustment Assistance program under Section 201 and 209 of the Public Works and Economic Development Act (PWEDA) as amended, 42 U.S.C. 3141 and 3149.
- C. Federal Participation Disclosure: This Project will be partially funded with Federal funds from the United States Department of Commerce, Economic Development Administration and is therefore subject to the Federal laws and regulations associated with that program.
- D. The project includes but is not limited to:
  - a. We are seeking a professional construction team with demonstrated experience in the construction of interior renovations to support multi-tenant spaces within the CMURC business incubator facility in Mount Pleasant, located at 2625 Denison Drive, Mount Pleasant, MI 48858. This approximate 11,500 square foot renovation will provide consistent architecture and interior design compared to the recently renovated CMURC spaces in



Midland (801 Joe Mann Blvd., Suite P, Midland, MI 48642) and Saginaw (203 S. Washington Ste 260, Saginaw, MI 48602).

- b. This 11,489 square foot renovation will include:
  - 1. Demolition of existing office space and toilet rooms
  - 2. Reconfiguration of office space throughout to meet the users' current needs and future growth
  - 3. Creation of a public café area
  - 4. Installation of modular walls, doors, and finishes, provide flexibility for future incubator tenants
  - 5. Relocation of utilities including HVAC, plumbing, electrical, lighting, fire alarm, fire suppression and IT infrastructure.
- c. Please refer to drawings and specifications, prepared by Neumann/Smith Architecture, dated April 28, 2023 for a complete scope of work.

#### **8. GENERAL REQUIREMENTS:**

- A. Upon receipt of Bid Documents verify that documents are complete.
- B. Immediately notify the Owner AND Architect in writing upon finding discrepancies or omissions in the Bid Documents.
- C. Bid Documents are made available only for the purpose of obtaining offers for this project. Their use does not grant a license for other purposes.
- D. Bidders will be required to provide bid security in the form of a Bid Bond for 5% of their entire bid amount. The successful bidder will also be required to furnish performance, labor, and material payment bonds equal to 100% of the contract price.
- E. This project will be constructed under a unified contract held by the General Contractor with the Owner, which will include all construction trades required to complete the work as shown and specified in the contract documents. Segregated Bids will not be accepted.
- F. Amendments to the submitted offer will be permitted if received in writing prior to bid closing and if endorsed by the same party or parties who signed and sealed the offer.

#### **9. STANDARD BID FORM INCLUSION REQUIREMENTS**

- A. Submit your offer on the Bid Form provided, fully filled out along with all supplements unless directed otherwise. Bidders may supplement this form as appropriate. The Bidder shall submit the following Supplements as part of the bid submission:
  - 1. The Contractor shall pay sales, consumer, use and similar taxes for the work provided by the Contractor which are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.
  - 2. The Contractor will be responsible for all permits.
- B. Execute bid fully and properly by filling in the Bid Form furnished in Section 00 4100 of this document. Submit in triplicate on the forms provided, in a sealed envelope to this office on or before the time and date set for the opening of the bids.

#### **10. BID FORM SIGNATURE REQUIREMENTS**

- A. The Bid Form shall be signed by the bidder, as follows:
  - 1. Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Insert the words "Sole Proprietor" under the signature. Each signature must be witnessed.
  - 2. Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" under each signature. Signature of one partner shall be accompanied by a certified copy of the power of attorney authorizing the individual signing to bind all partners. If bid is signed by all partners, no authorization is needed.

3. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the capacity in which the signing by officials acts, under each signature. Affix the corporate seal. If the bid is signed by officials other than the president and secretary of the company, or the president/secretary/treasurer of the company. A copy of the by-law resolution of their board of directors authorizing them to do so, must also be submitted with the Bid Form in the bid envelope.
4. Joint Venture: Each party of the joint venture shall execute the Bid Form under their respective seals in a manner appropriate to such party as described above, similar to the requirements of a Partnership.

#### **11. BID INELIGIBILITY**

- G. The Owner reserves the right to reject any and all submissions without explanation, either in whole or in part; to waive informalities and/or to negotiate separately in any matter whenever it is deemed in the sole opinion of the Owner to be in its best interest.
- H. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may at the discretion of the Owner, be declared unacceptable.
- I. Bid Forms, Appendices, and enclosures which are improperly prepared may, at the discretion of Owner, be declared unacceptable.
- J. Failure to provide security deposit, bonding or insurance requirements may, at the discretion of Owner, invalidate the bid.
- K. Failure to meet the Owners pre-qualification criteria may, at the discretion of the Owner, invalidate the bid.

#### **12. INQUIRIES/ADDENDA**

- A. Direct questions to the CMU Project Manager at (989) 774-1910, or email at [tanne1p@cmich.edu](mailto:tanne1p@cmich.edu). Send a copy of all questions to Neumann/Smith Architecture, Philip Herriges, RA via email at [pherriges@neumannsmith.com](mailto:pherriges@neumannsmith.com)
- B. Contractual Language and Clarifications: Owner will not negotiate contract language following the opening of bids. Therefore, the Contractor shall review and address any and all exceptions to contractual language with written requests for clarification to Central Michigan University prior to RFI Cut-off date and time.
- C. Addenda may be issued during the bidding period. All Addenda become part of the Contract Documents. Include resultant costs in the Bid Amount.
- D. Verbal answers are not binding on any party.
- E. Clarifications requested by bidders must be in writing not less than 7 days before date set for receipt of bids. The reply will be in the form of an Addendum, a copy of which will be forwarded to known recipients.

#### **13. MINORITY AND WOMEN OWNED SUBCONTRACTORS AND SUPPLIERS**

- A. Bidders are encouraged to utilize the service of minority and women owned subcontractors and suppliers where possible in the pursuance of this project.

#### **14. DEFINITIONS**

- A. Bid Documents: Contract Documents supplemented with Invitation to Bid, Instructions to Bidders, Information Available to Bidders, Bid Form Supplement, Bid Forms and Appendices identified.
- B. Contract Document: Defined in AIA A201 Article 1, as amended by Owner including issued Addenda.
- C. Bid, Offer, or Bidding: Act of submitting an offer.
- D. Bid Amount: Monetary sum identified by the Bidder in the Bid Form.

**15. CONTRACT DOCUMENTS IDENTIFICATION**

- A. The Contract Documents are identified as Central Michigan University CMURC Rural Rescue Impact Plan – Isabella Transformation (RRIP-IT); Award # 06-01-06375 as prepared by Neumann/Smith Architecture, and as identified in the Project Manual and AIA Document A101-2017, AIA Document A101-2017 Exhibit A and AIA Document A201-2017, as amended by Owner.

**16. DURATION OF OFFER**

- A. Your offer is required to be submitted under a condition of irrevocability and forfeiture of your entire bid security for a period of 60 days after submission.
- B. Upon acceptance by the University, an executed copy of the contract will be returned to the Contractor as their official notice of award. The Contract, however, shall not be in force until the Contractor has complied with all of the requirements of insurance and bonds.

**17. BASIS OF AWARD**

- A. Central Michigan University defines a responsive bidder as one that meets the technical minimum requirements to complete the pertinent scope of work, has also provided a complete bid proposal that meets the requirements of the Bidding Documents and has an approved pre-qualification status with CMU. The project award will be based upon the responsive bidder that provides the lowest proposed cost when considering the lump sum bid portion of the proposal.
- B. In the event there are Owner defined alternates, they will be accepted in the order in which they are listed and combined with the base bid to determine the lowest complete bid that meets the Owner's pre-defined budget.
- C. The responsive bidder shall provide its Unique Entity Identifier from System for Award Management (SAM). Additional information may be found at the SAM Internet site, currently at:  
<https://www.SAM.gov>.

**18. PRE-CONSTRUCTION MEETING**

- A. Before the start of construction, a pre-construction meeting shall be held. It shall be the Contractor's responsibility to arrange said meeting as soon as notification of award has been made by the Owner. Coordinate location of the meeting with the University Project Manager. Once the Work is started, it shall proceed to completion without delay.

**END OF SECTION 00 1000**

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## SUBSTITUTION REQUEST

Project: \_\_\_\_\_ Substitution Request Number: \_\_\_\_\_  
\_\_\_\_\_  
From: \_\_\_\_\_  
To: \_\_\_\_\_ Date: \_\_\_\_\_  
\_\_\_\_\_  
A/E Project Number: \_\_\_\_\_  
Re: \_\_\_\_\_ Contract For: \_\_\_\_\_

Specification Title: \_\_\_\_\_ Description: \_\_\_\_\_  
Section: \_\_\_\_\_ Page: \_\_\_\_\_ Article/Paragraph: \_\_\_\_\_

Proposed Substitution: \_\_\_\_\_  
Manufacturer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_  
Trade Name: \_\_\_\_\_ Model No.: \_\_\_\_\_  
Installer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_  
History: ☐ New product ☐ 2-5 years old ☐ 5-10 yrs old ☐ More than 10 years old  
Differences between proposed substitution and specified product: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

☐ Point-by-point comparative data attached - REQUIRED BY A/E

Reason for not providing specified item: \_\_\_\_\_  
\_\_\_\_\_

### Similar Installation:

Project: \_\_\_\_\_ Architect: \_\_\_\_\_  
Address: \_\_\_\_\_ Owner: \_\_\_\_\_  
\_\_\_\_\_ Date Installed: \_\_\_\_\_

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Savings to Owner for accepting substitution: \_\_\_\_\_ (\$ \_\_\_\_\_).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] \_\_\_\_\_ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ \_\_\_\_\_

# SUBSTITUTION REQUEST (Continued)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: \_\_\_\_\_

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

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

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

Telephone: \_\_\_\_\_

Attachments: \_\_\_\_\_

## A/E's REVIEW AND ACTION

- ☐ Substitution approved - Make submittals in accordance with Specification Section 01 25 00.  
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00.  
☐ Substitution rejected - Use specified materials.  
☐ Substitution Request received too late - Use specified materials.

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

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

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐ \_\_\_\_\_

# **U. S. DEPARTMENT OF COMMERCE ECONOMIC DEVELOPMENT ADMINISTRATION**



## **EDA CONTRACTING PROVISIONS FOR CONSTRUCTION PROJECTS**

These EDA Contracting Provisions for Construction Projects (EDA Contracting Provisions) are intended for use by recipients receiving federal assistance from the U. S. Department of Commerce - Economic Development Administration (EDA). They contain provisions specific to EDA and other federal provisions not normally found in non-federal contract documents. The requirements contained herein must be incorporated into all construction contracts and subcontracts funded wholly or in part with federal assistance from EDA.

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## 1. **DEFINITIONS**

*Agreement* – The written instrument that is evidence of the agreement between the Owner and the Contractor overseeing the Work.

*Architect/Engineer* - The person or other entity engaged by the Recipient to perform architectural, engineering, design, and other services related to the work as provided for in the contract.

*Contract* – The entire and integrated written agreement between the Owner and the Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

*Contract Documents* – Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents.

*Contractor* – The individual or entity with whom the Owner has entered into the Agreement.

*Drawings or Plans* – That part of the Contract Documents prepared or approved by the Architect/Engineer that graphically shows the scope, extent, and character of the Work to be performed by the Contractor.

*EDA* - The United States of America acting through the Economic Development Administration of the U.S. Department of Commerce or any other person designated to act on its behalf. EDA has agreed to provide financial assistance to the Owner, which includes assistance in financing the Work to be performed under this Contract. Notwithstanding EDA's role, nothing in this Contract shall be construed to create any contractual relationship between the Contractor and EDA.

*Owner* – The individual or entity with whom the Contractor has entered into the Agreement and for whom the Work is to be performed.

*Project* – The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

*Recipient* – A non-Federal entity receiving a Federal financial assistance award directly from EDA to carry out an activity under an EDA program, including any EDA-approved successor to the entity.

*Specifications* – That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

*Subcontractor* – An individual or entity having direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

*Work* – The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

## 2. **APPLICABILITY**

The Project to which the construction work covered by this Contract pertains is being assisted by the United States of America through federal assistance provided by the U.S. Department of Commerce - Economic Development Administration (EDA). Neither EDA, nor any of its departments, entities, or employees is a party to this Contract. The following EDA Contracting Provisions are included in this Contract and all subcontracts or related instruments pursuant to the provisions applicable to such federal assistance from EDA.

## 3. **FEDERALLY REQUIRED CONTRACT PROVISIONS**

(a) All contracts in excess of the simplified acquisition threshold - currently fixed at \$150,000 (*see* 41 U.S.C. §§ 134 and 1908) must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as may be appropriate.

(b) All contracts in excess of \$10,000 must address termination for cause and for convenience by the Recipient including the manner by which it will be effected and the basis for settlement.

(c) All construction contracts awarded in excess of \$10,000 by recipients of federal assistance and their contractors or subcontractors shall contain a provision requiring compliance with Executive Order 11246 of September 24, 1965, *Equal Employment Opportunity*, as amended by Executive Order 11375 of October 13, 1967, and Department of Labor implementing regulations at 41 C.F.R. part 60.

(d) All prime construction contracts in excess of \$2,000 awarded by Recipients must include a provision for compliance with the Davis-Bacon Act (40 U.S.C. §§ 3141-3148) as supplemented by Department of Labor regulations at 29 C.F.R. part 5. The contracts must also include a provision for compliance with the Copeland "Anti-Kickback" Act (18 U.S.C. § 874 and 40 U.S.C. § 3145) as supplemented by Department of Labor regulations at 29 C.F.R. part 3.

(e) All contracts awarded by the Recipient in excess of \$100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. §§ 3702 and 3704 (the Contract Work Hours and Safety Standards Act) as supplemented by Department of Labor regulations at 29 C.F.R. part 5.

(f) All contracts must include EDA requirements and regulations that involve a requirement on the contractor or sub-contractor to report information to EDA, the Recipient or any other federal agency.

- (g) All contracts must include EDA requirements and regulations pertaining to patent rights with respect to any discovery or invention which arises or is developed in the course of or under such contract.
- (h) All contracts must include EDA requirements and regulations pertaining to copyrights and rights in data.
- (i) All contracts and subgrants in excess of \$150,000 must contain a provision that requires compliance with all applicable standards, orders, or requirements issued under the Clean Air Act (42 U.S.C. § 7401 *et seq.*) and the Federal Water Pollution Control Act (Clean Water Act) (33 U.S.C. § 1251 *et seq.*), and Executive Order 11738, *Providing for Administration of the Clean Air Act and the Federal Water Pollution Control Act With Respect to Federal Contracts, Grants, or Loans*.
- (j) Contracts must contain mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. § 6201).
- (k) Contracts must contain a provision ensuring that contracts are not to be made to parties on the government wide Excluded Parties List System in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 C.F.R. part 180.
- (l) Contracts must contain a provision ensure compliance with the Byrd Anti-Lobbying Amendment (31 U.S.C. § 1352) under which contractors that apply or bid for an award of \$100,000 or more must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. § 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.
- (m) If the Recipient is a state agency or agency of a political subdivision of a state, any contract awarded must contain a provision ensuring compliance with section 6002 of the Solid Waste Disposal Act (42 U.S.C. § 6962), as amended by the Resource Conservation and Recovery Act related to the procurement of recovered materials.

#### 4. **REQUIRED PROVISIONS DEEMED INSERTED**

Each and every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein and the contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party the contract shall forthwith be physically amended to make such insertion of correction.

5. **INSPECTION BY EDA REPRESENTATIVES**

The authorized representatives and agents of EDA shall be permitted to inspect all work, materials, payrolls, personnel records, invoices of materials, and other relevant data and records.

6. **EXAMINATION AND RETENTION OF CONTRACTOR'S RECORDS**

(a) The Owner, EDA, or the Comptroller General of the United States, or any of their duly authorized representatives shall, generally until three years after final payment under this contract, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract for the purpose of making audit, examination, excerpts, and transcriptions.

(b) The Contractor agrees to include in first-tier subcontracts under this contract a clause substantially the same as paragraph (a) above. "Subcontract," as used in this clause, excludes purchase orders that do not exceed \$10,000.

(c) The periods of access and examination in paragraphs (a) and (b) above for records relating to (1) appeals under the disputes clause of this contract, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which the Owner, EDA, or Comptroller General or any of their duly authorized representatives has taken exception shall continue until disposition of such appeals, litigation, claims, or exceptions.

7. **CONSTRUCTION SCHEDULE AND PERIODIC ESTIMATES**

Immediately after execution and delivery of the contract, and before the first partial payment is made, the Contractor shall deliver to the Owner an estimated construction progress schedule in a form satisfactory to the Owner, showing the proposed dates of commencement and completion of each of the various subdivisions of work required under the Contract Documents and the anticipated amount of each monthly payment that will become due to the Contractor in accordance with the progress schedule. The Contractor also shall furnish the Owner (a) a detailed estimate giving a complete breakdown of the contract price and (b) periodic itemized estimates of work done for the purpose of making partial payments thereon. The costs employed in making up any of these schedules will be used only to determine the basis of partial payments and will not be considered as fixing a basis for additions to or deductions from the contract price.

8. **CONTRACTOR'S TITLE TO MATERIAL**

No materials, supplies, or equipment for the work shall be purchased by the Contractor or by any subcontractor that is subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. The Contractor warrants and guarantees that he/she has good title to all work, materials, and equipment used by him/her in the Work, free and clear of all liens, claims, or encumbrances.

9. **INSPECTION AND TESTING OF MATERIALS**

All materials and equipment used in the completion of the Work shall be subject to adequate inspection and testing in accordance with accepted standards. The laboratory or inspection agency shall be selected by the Owner. Materials of construction, particularly those upon which the strength and durability of any structure may depend, shall be subject to inspection and testing to establish conformance with specifications and suitability for intended uses.

10. **"OR EQUAL" CLAUSE**

Whenever a material, article, or piece of equipment is identified in the Contract Documents by reference to manufacturers' or vendors' names, trade names, catalogue numbers, etc., it is intended merely to establish a standard. Any material, article, or equipment of other manufacturers and vendors that will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article, or equipment so proposed is, in the opinion of the Architect/Engineer, of equal substance and function. However, such substitution material, article, or equipment shall not be purchased or installed by the Contractor without the Architect/Engineer's written approval.

11. **PATENT FEES AND ROYALTIES**

(a) Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device that is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Architect/Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by the Owner in the Contract Documents.

(b) To the fullest extent permitted by Laws and Regulations, the Contractor shall indemnify and hold harmless the Owner and the Architect/Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

12. **CLAIMS FOR EXTRA COSTS**

No claims for extra work or cost shall be allowed unless the same was done in pursuance of a written order from the Architect/Engineer approved by the Owner.

### 13. **CONTRACTORS AND SUBCONTRACTORS INSURANCE**

(a) The Contractor shall not commence work under this Contract until the Contractor has obtained all insurance reasonably required by the Owner, nor shall the Contractor allow any subcontractor to commence work on his/her subcontract until the insurance required of the subcontractor has been so obtained and approved.

(b) Types of insurance normally required are:

- (1) Workers' Compensation
- (2) Contractor's Public Liability and Property Damage
- (3) Contractor's Vehicle Liability
- (4) Subcontractors' Public Liability, Property Damage and Vehicle Liability
- (5) Builder's Risk (Fire and Extended Coverage)

(c) **Scope of Insurance and Special Hazards:** The insurance obtained, which is described above, shall provide adequate protection for the Contractor and his/her subcontractors, respectively, against damage claims that may arise from operations under this contract, whether such operations be by the insured or by anyone directly or indirectly employed by him/her and also against any of the special hazards that may be encountered in the performance of this Contract.

(d) **Proof of Carriage of Insurance:** The Contractor shall furnish the Owner with certificates showing the type, amount, class of operations covered, effective dates, and dates of expiration of applicable insurance policies.

### 14. **CONTRACT SECURITY BONDS**

(a) If the amount of this Contract exceeds \$150,000, the Contractor shall furnish a performance bond in an amount at least equal to one hundred percent (100%) of the Contract price as security for the faithful performance of this Contract and also a payment bond in an amount equal to one hundred percent (100%) of the Contract price or in a penal sum not less than that prescribed by State, Territorial, or local law, as security for the payment of all persons performing labor on the Work under this Contract and furnishing materials in connection with this Contract. The performance bond and the payment bond may be in one or in separate instruments in accordance with local law. Before final acceptance, each bond must be approved by EDA. If the amount of this Contract does not exceed \$150,000, the Owner shall specify the amount of the payment and performance bonds.

(b) All bonds shall be in the form prescribed by the Contract Documents except as otherwise provided in applicable laws or regulations, and shall be executed by such sureties as are named in the current list of *Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies* as published in Treasury Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent must be accompanied by a certified copy of the agent's

authority to act. Surety companies executing the bonds must also be authorized to transact business in the state where the Work is located.

15. **LABOR STANDARDS - DAVIS-BACON AND RELATED ACTS**  
**(as required by section 602 of PWEDA)**

(a) **Minimum Wages**

(1) All laborers and mechanics employed or working upon the site of the Work in the construction or development of the Project will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act at 29 C.F.R. part 3, the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at the time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor, which is attached hereto and made a part hereof, regardless of any contractual relationship that may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 C.F.R. § 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 C.F.R. § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates determined under 29 C.F.R. § 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(2) (i) Any class of laborers or mechanics to be employed under the Contract, but not listed in the wage determination, shall be classified in conformance with the wage determination. EDA shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(A) The work to be performed by the classification requested is not performed by a classification in the wage determination;

(B) The classification is utilized in the area by the construction industry; and

(C) The proposed wage rate, including any bona fide fringe benefits, bears a

reasonable relationship to the wage rates contained in the wage determination.

(ii) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and EDA or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by EDA or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210.

(iii) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and EDA or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), EDA or its designee shall refer the questions, including the views of all interested parties and the recommendation of EDA or its designee, to the Administrator for determination.

(iv) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(2)(ii) or (iii) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(3) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(4) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

**(b) Withholding**

EDA or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this Contract or any other federal contract with the same prime Contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the Contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper employed or working on the site of the Work in the construction or development of the Project, all or part of the wages required by the Contract, EDA or its designee may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations



have ceased. EDA or its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

(c) **Payrolls and basic records**

(1) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the Work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the Work in the construction or development of the Project. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 C.F.R. § 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, the plan or program is financially responsible, and the plan or program has been communicated in writing to the laborers or mechanics affected, and provide records that show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(2) (i) For each week in which Contract work is performed, the Contractor shall submit a copy of all payrolls to the Owner for transmission to EDA or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 C.F.R. part 5.5(a)(3)(i). This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose. It may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, D.C. 20402; or downloaded from the U.S. Department of Labor's website at <https://www.dol.gov/whd/forms/wh347.pdf>. The prime Contractor is responsible for the submission of copies of payrolls by all subcontractors

(ii) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the Contract and shall certify the following:

(A) That the payroll for the payroll period contains the information required to be maintained under 29 C.F.R. § 5.5(a)(3)(i) and that such information is correct and complete;

(B) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the Contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 C.F.R. part 3; and

(C) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the Contract.

(iii) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 15(c)(2)(ii) of this section.

(iv) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under section 1001 of Title 18 and section 3729 of Title 31 of the U.S. Code.

(3) The Contractor or subcontractor shall make the records required under paragraph 15(c)(1) of this section available for inspection, copying, or transcription by authorized representatives of EDA or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, EDA or its designee may, after written notice to the Contractor or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 C.F.R. § 5.12.

(d) **Apprentices and Trainees.**

(1) **Apprentices.** Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training (Bureau), or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any

apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a Contractor is performing construction on a Project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) **Trainees.** Except as provided in 29 C.F.R. § 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program that has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman's hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(3) **Equal employment opportunity.** The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity

requirements of Executive Order 11246, *Equal Employment Opportunity*, as amended, and 29 C.F.R. part 30.

(e) **Compliance with Copeland Anti-Kickback Act Requirements.** The Contractor shall comply with the Copeland Anti-Kickback Act (18 U.S.C. § 874 and 40 U.S.C. § 3145) as supplemented by Department of Labor regulations (29 C.F.R. part 3, “Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States”). The Act provides that the Contractor and any subcontractors shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which they are otherwise entitled. The Owner shall report all suspected or reported violations to EDA.

(f) **Subcontracts.** The Contractor and any subcontractors will insert in any subcontracts the clauses contained in 29 C.F.R. §§ 5.5(a)(1) through (10) and such other clauses as EDA or its designee may require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 C.F.R. § 5.5.

(g) **Contract termination; debarment.** The breach of the contract clauses in 29 C.F.R. § 5.5 may be grounds for termination of the contract, and for debarment as a Contractor and a subcontractor as provided in 29 C.F.R. § 5.12.

(h) **Compliance with Davis-Bacon and Related Act Requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 C.F.R. parts 1, 3, and 5 are herein incorporated by reference in this contract.

(i) **Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 C.F.R. parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and EDA or its designee, the U.S. Department of Labor, or the employees or their representatives.

(j) **Certification of Eligibility.**

(1) By entering into this Contract, the Contractor certifies that neither it nor any person or firm that has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 C.F.R. § 5.12(a)(1).

(2) No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 C.F.R. § 5.12(a)(1).

(3) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. § 1001.

16. **LABOR STANDARDS - CONTRACT WORK HOURS AND SAFETY STANDARDS ACT**

As used in this paragraph, the terms “laborers” and “mechanics” include watchmen and guards.

(a) **Overtime requirements.** No Contractor or subcontractor contracting for any part of the Contract work, which may require or involve the employment of laborers or mechanics, shall require or permit any such laborer or mechanic in any workweek in which that person is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(b) **Violation; liability for unpaid wages, liquidated damages.** In the event of any violation of the clause set forth in paragraph (a) of this section, the Contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a) of this section.

(c) **Withholding for unpaid wages and liquidated damages.** EDA or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies payable on account of work performed by the Contractor or subcontractor under any such Contract or any other federal contract with the same prime Contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b) of this section.

(d) **Subcontracts.** The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (a) through (c) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a) through (c) of this section.

17. **EQUAL EMPLOYMENT OPPORTUNITY**

(a) The Recipient hereby agrees that it will incorporate or cause to be incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 C.F.R. chapter 60, which is paid for in whole or in part with funds obtained from EDA, the following equal opportunity clause:

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

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(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The 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 race, color, religion, sex, sexual orientation, gender identity, or national origin.

(3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

(4) The 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 advising the said labor union or workers representatives of the Contractor's commitments hereunder, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(5) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965 and of the rules, regulations, and relevant orders of the Secretary of Labor.

(6) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by EDA and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(7) In the event of the Contractor's noncompliance with the nondiscrimination clauses of

this Contract or with any of the said rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally-assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation or order of the Secretary of Labor, or as otherwise provided by law.

(8) The Contractor will include the portion of the sentence immediately preceding paragraph 17(a)(1) and the provisions of paragraphs 17(a)(1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as EDA or the Secretary of Labor may direct as a means of enforcing such provisions, including sanctions for noncompliance. Provided, however, that in the event the Contractor becomes involved in or is threatened with litigation with a subcontractor or vendor as a result of such direction by EDA or the Secretary of Labor, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

(9) The Recipient further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally-assisted construction work. Provided, however, that if the Recipient so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality, or subdivision of such government that does not participate in work on or under the Contract.

(10) The Recipient agrees that it will assist and cooperate actively with EDA and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish EDA and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist EDA in the discharge of the EDA's primary responsibility for securing compliance.

(11) The Recipient further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a Contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by EDA or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the Recipient agrees that if it fails or refuses to comply with these undertakings, EDA may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this EDA financial assistance; refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case

to the Department of Justice for appropriate legal proceedings.

(b) Exemptions to Above Equal Opportunity Clause (41 C.F.R. chapter 60):

(1) Contracts and subcontracts not exceeding \$10,000 (other than Government bills of lading, and other than contracts and subcontracts with depositories of Federal funds in any amount and with financial institutions which are issuing and paying agents for U.S. savings bonds and savings notes) are exempt. The amount of the Contract, rather than the amount of the federal financial assistance, shall govern in determining the applicability of this exemption.

(2) Except in the case of subcontractors for the performance of construction work at the site of construction, the clause shall not be required to be inserted in subcontracts below the second tier.

(3) Contracts and subcontracts not exceeding \$10,000 for standard commercial supplies or raw materials are exempt.

18. **CONTRACTING WITH SMALL, MINORITY AND WOMEN'S BUSINESSES**

(a) If the Contractor intends to let any subcontracts for a portion of the work, the Contractor shall take affirmative steps to assure that small, minority and women's businesses are used when possible as sources of supplies, equipment, construction, and services.

(b) Affirmative steps shall consist of:

(1) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;

(2) Ensuring that small and minority businesses and women's business enterprises are solicited whenever they are potential sources;

(3) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses and women's business enterprises;

(4) Establishing delivery schedules, where the requirements of the contract permit, which encourage participation by small and minority businesses and women's business enterprises;

(5) Using the services and assistance of the U.S. Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and State and local governmental small business agencies;

(6) Requiring each party to a subcontract to take the affirmative steps of this section; and



(7) The Contractor is encouraged to procure goods and services from labor surplus area firms.

19. **HEALTH, SAFETY, AND ACCIDENT PREVENTION**

(a) In performing this contract, the Contractor shall:

- (1) Ensure that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to their health and/or safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation;
- (2) Protect the lives, health, and safety of other persons;
- (3) Prevent damage to property, materials, supplies, and equipment; and
- (4) Avoid work interruptions.

(b) For these purposes, the Contractor shall:

- (1) Comply with regulations and standards issued by the Secretary of Labor at 29 C.F.R. part 1926. Failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (40 U.S.C. §§ 3701 – 3708); and
- (2) Include the terms of this clause in every subcontract so that such terms will be binding on each subcontractor.

(c) The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this Contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment, and shall report this data in the manner prescribed by 29 C.F.R. part 1904.

(d) The Owner shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the Work, shall be deemed sufficient notice of the noncompliance and corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to take corrective action promptly, the Owner may issue an order stopping all or part of the Work until satisfactory corrective action has been taken. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.

(e) The Contractor shall be responsible for its subcontractors' compliance with the provisions of this clause. The Contractor shall take such action with respect to any subcontract as EDA, or the Secretary of Labor shall direct as a means of enforcing such provisions.

20. **CONFLICT OF INTEREST AND OTHER PROHIBITED INTERESTS**

(a) No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept, or approve, or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction or material supply contract or any subcontract in connection with the construction of the Project, shall become directly or indirectly interested personally in this Contract or in any part hereof.

(b) No officer, employee, architect, attorney, engineer, or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the Project, shall become directly or indirectly interested personally in this Contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the Project.

(c) The Contractor may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the Contract Documents has a corporate or financial affiliation with the supplier or manufacturer.

(d) The Owner's officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, may be involved. Such a conflict may arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest in the Contractor. The Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors, or anything of monetary value from the Contractor or subcontractors.

(e) If the Owner finds after a notice and hearing that the Contractor, or any of the Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of the Owner or EDA in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, the Owner may, by written notice to the Contractor, terminate this Contract. The Owner may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which the Owner bases such findings shall be an issue and may be reviewed in proceedings under the dispute resolution provisions of this Contract.

(f) In the event this Contract is terminated as provided in paragraph (e) of this section, the Owner may pursue the same remedies against the Contractor as it could pursue in the event of a breach of this Contract by the Contractor. As a penalty, in addition to any other damages to which it may be entitled by law, the Owner may pursue exemplary damages in an amount (as determined by the Owner) which shall not be less than three nor more than ten times the costs the Contractor incurs in providing any such gratuities to any such officer or employee.

## 21. **RESTRICTIONS ON LOBBYING**

(a) This Contract, or subcontract is subject to 31 U.S.C. § 1352, regarding lobbying restrictions. The section is explained in the common rule, 15 C.F.R. part 28 (55 FR 6736-6748, February 26, 1990). Each bidder under this Contract or subcontract is generally prohibited from using federal funds for lobbying the Executive or Legislative Branches of the Federal Government in connection with this EDA Award.

(b) **Contract Clause Threshold:** This Contract Clause regarding lobbying must be included in each bid for a contract or subcontract exceeding \$100,000 of federal funds at any tier under the EDA Award.

(c) **Certification and Disclosure:** Each bidder of a contract or subcontract exceeding \$100,000 of federal funds at any tier under the federal Award must file Form CD-512, *Certification Regarding Lobbying – Lower Tier Covered Transactions*, and, if applicable, Standard Form-LLL, *Disclosure of Lobbying Activities*, regarding the use of any nonfederal funds for lobbying. Certifications shall be retained by the Contractor or subcontractor at the next higher tier. All disclosure forms, however, shall be forwarded from tier to tier until received by the Recipient of the EDA Award, who shall forward all disclosure forms to EDA.

(d) **Continuing Disclosure Requirement:** Each Contractor or subcontractor that is subject to the Certification and Disclosure provision of this Contract Clause is required to file a disclosure form at the end of each calendar quarter in which there occurs any event that requires disclosure or that materially affects the accuracy of the information contained in any disclosure form previously filed by such person. Disclosure forms shall be forwarded from tier to tier until received by the Recipient of the EDA Award, who shall forward all disclosure forms to EDA.

(e) **Indian Tribes, Tribal Organizations, or Other Indian Organizations:** Indian tribes, tribal organizations, or any other Indian organizations, including Alaskan Native organizations, are excluded from the above lobbying restrictions and reporting requirements, but only with respect to expenditures that are by such tribes or organizations for lobbying activities permitted by other federal law. An Indian tribe or organization that is seeking an exclusion from Certification and Disclosure requirements must provide EDA with the citation of the provision or provisions of federal law upon which it relies to conduct lobbying activities that would otherwise be subject to the prohibitions in and to the Certification and Disclosure requirements of 31 U.S.C. § 1352, preferably through an attorney's opinion. Note, also, that a non-Indian subrecipient, contractor, or subcontractor under an award to an Indian tribe, for example, is subject to the restrictions and reporting requirements.

## 22. **HISTORICAL AND ARCHAEOLOGICAL DATA PRESERVATION**

The Contractor agrees to facilitate the preservation and enhancement of structures and objects of historical, architectural or archaeological significance and when such items are found and/or unearthed during the course of project construction. Any excavation by the Contractor that uncovers an historical or archaeological artifact shall be immediately reported to the Owner and a representative of EDA. Construction shall be temporarily halted pending the notification process and further directions issued by EDA after consultation with the State Historic

Preservation Officer (SHPO) for recovery of the items. *See* the National Historic Preservation Act of 1966 (54 U.S.C. § 300101 *et seq.*, formerly at 16 U.S.C. § 470 *et seq.*) and Executive Order No. 11593 of May 31, 1971.

23. **CLEAN AIR AND WATER**

Applicable to Contracts in Excess of \$150,000

(a) **Definition.** “Facility” means any building, plant, installation, structure, mine, vessel, or other floating craft, location, or site of operations, owned, leased, or supervised by the Contractor or any subcontractor, used in the performance of the Contract or any subcontract. When a location or site of operations includes more than one building, plant, installation, or structure, the entire location or site shall be deemed a facility except when the Administrator, or a designee, of the United States Environmental Protection Agency (EPA) determines that independent facilities are collocated in one geographical area.

(b) In compliance with regulations issued by the EPA, 2 C.F.R. part 1532, pursuant to the Clean Air Act, as amended (42 U.S.C. § 7401 *et seq.*); the Federal Water Pollution Control Act, as amended (33 U.S.C. § 1251 *et seq.*); and Executive Order 11738, the Contractor agrees to:

(1) Not utilize any facility in the performance of this contract or any subcontract which is listed on the Excluded Parties List System, part of the System for Award Management (SAM), pursuant to 2 C.F.R. part 1532 for the duration of time that the facility remains on the list;

(2) Promptly notify the Owner if a facility the Contractor intends to use in the performance of this contract is on the Excluded Parties List System or the Contractor knows that it has been recommended to be placed on the List;

(3) Comply with all requirements of the Clean Air Act and the Federal Water Pollution Control Act, including the requirements of section 114 of the Clean Air Act and section 308 of the Federal Water Pollution Control Act, and all applicable clean air and clean water standards; and

(4) Include or cause to be included the provisions of this clause in every subcontract and take such action as EDA may direct as a means of enforcing such provisions.

24. **USE OF LEAD-BASED PAINTS ON RESIDENTIAL STRUCTURES**

(a) If the work under this Contract involves construction or rehabilitation of residential structures over \$5,000, the Contractor shall comply with the Lead-based Paint Poisoning Prevention Act (42 U.S.C. § 4831). The Contractor shall assure that paint or other surface coatings used in a residential property does not contain lead equal to or in excess of 1.0 milligram per square centimeter or 0.5 percent by weight or 5,000 parts per million (ppm) by weight. For purposes of this section, “residential property” means a dwelling unit, common areas, building exterior surfaces, and any surrounding land, including outbuildings, fences and play equipment affixed to the land, belonging to an owner and available for use by residents, but not

including land used for agricultural, commercial, industrial or other non-residential purposes, and not including paint on the pavement of parking lots, garages, or roadways.

- (b) As a condition to receiving assistance under PWEDA, recipients shall assure that the restriction against the use of lead-based paint is included in all contracts and subcontracts involving the use of federal funds.

25. **ENERGY EFFICIENCY**

The Contractor shall comply with all standards and policies relating to energy efficiency which are contained in the energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. § 6201) for the State in which the Work under the Contract is performed.

26. **ENVIRONMENTAL REQUIREMENTS**

When constructing a Project involving trenching and/or other related earth excavations, the Contractor shall comply with the following environmental constraints:

- (1) **Wetlands.** When disposing of excess, spoil, or other construction materials on public or private property, the Contractor shall not fill in or otherwise convert wetlands.
- (2) **Floodplains.** When disposing of excess, spoil, or other construction materials on public or private property, the Contractor shall not fill in or otherwise convert 100 year floodplain areas delineated on the latest Federal Emergency Management Agency (FEMA) Floodplain Maps, or other appropriate maps, i.e., alluvial soils on Natural Resource Conservation Service (NRCS) Soil Survey Maps.
- (3) **Endangered Species.** The Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of the Contractor, the Contractor will immediately report this evidence to the Owner and a representative of EDA. Construction shall be temporarily halted pending the notification process and further directions issued by EDA after consultation with the U.S. Fish and Wildlife Service.

27. **DEBARMENT, SUSPENSION, INELIGIBILITY, AND VOLUNTARY EXCLUSIONS**

As required by Executive Orders 12549 and 12689, *Debarment and Suspension*, 2 C.F.R. Part 180 and implemented by the Department of Commerce at 2 C.F.R. part 1326, for prospective participants in lower tier covered transactions (except subcontracts for goods or services under the \$25,000 small purchase threshold unless the subrecipient will have a critical influence on or substantive control over the award), the Contractor agrees that:

- (1) By entering into this Contract, the Contractor and subcontractors certify, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared
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ineligible, or voluntarily excluded from participation in this Contract by any federal department or agency.

(2) Where the Contractor or subcontractors are unable to certify to any of the statements in this certification, the Contractor or subcontractors shall attach an explanation to this bid.

*See also 2 C.F.R. part 180 and 2 C.F.R. § 200.342.*

28. **EDA PROJECT SIGN**

The Contractor shall supply, erect, and maintain in good condition a Project sign according to the specifications provided by EDA. To the extent practical, the sign should be a free standing sign. Project signs shall not be located on public highway rights-of-way. Location and height of signs will be coordinated with the local agency responsible for highway or street safety in the Project area, if any possibility exists for obstructing vehicular traffic line of sight. Whenever the EDA site sign specifications conflict with State law or local ordinances, the EDA Regional Director will permit such conflicting specifications to be modified so as to comply with State law or local ordinance.

29. **BUY AMERICA**

To the greatest extent practicable, contractors are encouraged to purchase American-made equipment and products with funding provided under EDA financial assistance awards.

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ED101	FIRST FLOOR ENLARGED LIGHTING DEMOLITION PLAN
ED201	FIRST FLOOR ENLARGED POWER DEMOLITION PLAN
E101	FIRST FLOOR ENLARGED LIGHTING PLAN
E201	FIRST FLOOR ENLARGED POWER PLAN
E501	ONE LINE DIAGRAM
E502	ONE LINE DIAGRAM
E503	ONE LINE DIAGRAM
E701	LIGHTING SCHEDULES & ELECTRICAL DETAILS
E702	LIGHTING SCHEDULES & ELECTRICAL DETAILS
<b>END OF SECTION 00 2000</b>	

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## 00 4100 – BID FORM

### THE PROJECT AND THE PARTIES

**1.1. TO: Central Michigan University (Owner)**

Attention: Phil Tanner  
Project Manager  
Central Michigan University  
CSB 213  
Mount Pleasant, MI 48859

**1.2 FOR: CMURC Rural Rescue Impact Plan – Isabella Transformation (RRIP-IT)**

**1.3 DATE: (BIDDER TO ENTER DATE)**

**1.4 SUBMITTED BY: (BIDDER TO ENTER NAME AND ADDRESS)**

Bidder's Full Name:

Address:

City, State, Zip:

Phone No:

Fax No:

Email Address:

**1.5 BID AMOUNT**

- A. Having examined the Place of Work and having read and understood all requirements referred to in the Bidding and Contract documents for the above mentioned project we, the undersigned, hereby offer to enter into a contract to perform the Work and furnish all labor, materials, equipment, incidents and methods necessary for the proper execution and timely completion of the Work for the Sum of: \_\_\_\_\_ Dollars (\$ \_\_\_\_\_), in lawful money of the United States of America.
- B. All applicable sales, consumer use and similar taxes for the work provided by the Contractor which are legally enacted when the bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.
- C. All Cash and Contingency Allowances are included in the Bid Sum.
- D. The Amount \$ \_\_\_\_\_ is included in the Base bid for providing a Material and Labor Payment and Performance Bond. On bids of \$50,000.00 and greater, the Contractor shall furnish in an acceptable form, surety bonds in the amount of 100% of the Contractor sum as security for the faithful performance of this Contract and for the payment of all persons performing labor and furnishing materials in connection with this Contract. The cost of the aforesaid bonds shall be paid by the contractor.

**1.6 BID SECURITY**

- A. Accompanying the Bid, as required by the Instruction to Bidders, Section 00 1000, is a bid security in the form of (Bidder to cross out all but one) a Certified Check or a Bid Bond drawn on a bank based in the United States in the Amount of: \_\_\_\_\_ Dollars (\$ \_\_\_\_\_), equal to 5 percent of the base bid, made payable to the Owner, which it is agreed, shall be retained as liquidated damages, not as a penalty, if the undersigned fails to execute the Contract in conformity with the form of Contract incorporated in the proposed Contract Documents and fails to furnish required bonds within seven (7) days after date of issuance of written notice of selection for the award of a Contract to the undersigned.

**1.7 BASIS OF AWARD**

- A. Central Michigan University defines a responsive bidder as one that meets the technical minimum requirements to complete the pertinent scope of work and has also provided a complete bid proposal

that meets the requirements of the Bidding Documents. The project award will be based upon the bidder that provides the lowest proposed cost when considering the lump sum bid portion of the proposal.

- B. In the event there are Owner defined alternates, they will be accepted in the order in which they are listed and combined with the base bid to determine the lowest complete bid that meets the Owner's pre-defined budget

#### **1.8 ACCEPTANCE**

- A. This offer shall be open to acceptance and is irrevocable for sixty (60) days from the bid closing date.
- B. If this bid is accepted by Owner within the time period stated above, we will:
  - 1. Execute the Agreement within seven days of receipt of Notice of Award.
  - 2. Furnish the required bonds within seven days of receipt of Notice of Award.
  - 3. Commence work within seven days after written Notice to Proceed of this bid.
- C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to Owner by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.
- D. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instruction to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

#### **1.9 CONTRACT TIME**

- C. If this Bid is accepted, we will complete the work as required in the following milestone schedule:

Projected Start Date	July 31, 2023
Substantial Completion	December 2, 2024

#### **1.10 CONTRACT SUM AND LIMITATION OF DAMAGES**

- A. CONTRACT: Upon acceptance by the University, an executed copy of the contract will be returned to the Contractor as their official notice of award. The Contract, however, shall not be in force until the Contractor has complied with all of the requirement of insurance and bonds.
- B. The University agrees to pay and the Contractor agrees to accept the sum set forth in the Contractors Proposal, as its bid, accepted by the University, as full compensation for all labor, supervision, equipment, home office and field overhead, materials, administrative and incidental expense required in executing all of the work contemplated in this contract and set forth in the plans and specifications. Including all loss or damage arising out of the work, as impacted by the elements or from hidden obstructions, and delay or other difficulties, which may not be covered elsewhere.

#### **1.11 LIQUIDATED DAMAGES AND COMPLETION OF WORK**

- A. If awarded this contract, the Contractor agrees that time is an essential condition of the contract and will fully complete all construction work on or before the substantial completion date. Should the Contractor fail to complete all construction work by the specified substantial completion, it is agreed that the following sums WILL BE DEDUCTED from the contract amount for each and every calendar day the work is incomplete.
  - 1. \$1,500 per calendar day from Substantial Completion Date.
- B. It is also understood and agreed that this DEDUCTION from the contract is not a penalty but represents Liquidated Damages suffered by the Owner and is so fixed on a per diem basis because of the extreme difficulty in ascertaining the true and full amount of damages the Owner will sustain in the work under this contract is not complete by the stated date.

#### 1.12 CHANGES TO THE WORK

- A. When the Architect establishes that the method of valuation for Changes in the Work will be net cost (actual cost of labor and materials, including insurance and taxes, plus subcontractor's mark-up and less all discounts.) plus a percentage fee in accordance with General Conditions, our percentage fee that will not exceed the following:
1. \_\_\_\_\_ **(Bidder to provide)** percent overhead and profit on the net cost of our own work. (10% maximum)
  2. \_\_\_\_\_ **(Bidder to provide)** percent on the cost of work done by any Subcontractor limited to first and second tier subcontracts. (5% maximum)
- B. On work deleted from the Contract, Contractor's credit to the Owner shall be:
1. 100% percent on the estimated cost of our own work.
  2. 100% percent on the estimate cost of work deleted by any Subcontractor limited to first and second tier subcontracts.

#### 1.13 ADDENDA

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

Addendum #		Dated:	
Addendum #		Dated:	
Addendum #		Dated:	
Addendum #		Dated:	

#### 1.14 BID FORM SUPPLEMENTS

- A. The following Supplements are attached to this Bid Form and are considered an integral part of this Bid Form:
- a. Supplement A – Owner Requested Alternates

#### 1.15 BID FORM SIGNATURES

- A. Name of person, partnership, or corporation submitting bid (Check One)
1. ☐ An Individual
  2. ☐ A Partnership
  3. ☐ A Corporation organized and existing under the laws of the State of Michigan

\_\_\_\_\_  
(Bidder – print the full name of your firm)

Was hereinto affixed in the presence of:

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

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

**END OF BID FORM**

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## SECTION 00 4100.10 – SUPPLEMENT A – LIST OF ALTERNATES

### PARTICULARS

- 1.1** The following is the list of Alternates referenced in the bid submitted by:  
(Bidder) \_\_\_\_\_

TO (Owner) Central Michigan University

Dated \_\_\_\_\_ and which is an integral part of the Bid Form.

1. Alternates quoted on Bid Forms will be reviewed and accepted or rejected in the order in which they are listed and combined with the base bid to determine the lowest complete bid that meets the Owner's pre-defined budget. Accepted alternatives will be identified in the Owner-Contractor Agreement.
2. Coordinate related work and modify surrounding work to integrate the Work of each alternate.
3. Include in alternate price all materials, parts, and accessories required for a complete installation, inclusive of all trade work, regardless of whether they are mentioned in the alternate description.

### ALTERNATES LIST

- 2.1** The following amounts shall be added to or deducted from the Bid Amount; if no change in price is required, indicate no change.

- A. Deduct Alternate No. 1 – Open Office Acoustic Baffles:  
(Deduct) \$ \_\_\_\_\_
- B. Deduct Alternate No. 2 – Demountable Wall Partitions (Rooms 1020 through 1024):  
(Deduct) \$ \_\_\_\_\_
- C. Deduct Alternate No. 3 – Demountable Wall Partitions (Rooms 1016 through 1019):  
(Deduct) \$ \_\_\_\_\_
- D. Deduct Alternate No. 4 – Demountable Wall Partitions (Rooms 1025 through 1028):  
(Deduct) \$ \_\_\_\_\_
- E. Deduct Alternate No. 5 – V.I.P. Suite Millwork:  
(Deduct) \$ \_\_\_\_\_
- F. Deduct Alternate No. 6 – Work Café Millwork:  
(Deduct) \$ \_\_\_\_\_

**END OF SECTION 00 4100.10**

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**SECTION 00 5000 – FORM OF AGREEMENT**

- 1.1 AIA Document A101 – 2017, “Standard Form of Agreement between Owner and Contractor – where the basis of payment is a Stipulated Sum” as Amended by Owner, and AIA Document A101 – 2017 Exhibit A, “Insurance and Bonds” forms the basis of the Contract between the Owner and Contractor.

**AMENDMENTS TO AGREEMENT FORM**

- 2.1 The contractor shall review the attached contract and its amendments and resolve any issues with the University in writing not less than 7 days before date set for receipt of bids.

**END OF SECTION 00 5000**

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# 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 **TBD** day of **TBD** in the year **TBD**  
(In words, indicate day, month and year.)

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

Central Michigan University  
Mount Pleasant, MI 48859

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

**TBD**

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

CMURC Rural Rescue Impact Plan – Isabella Transformation (RRIP-IT)  
Award #: 06-01-06375

This project is located on Central Michigan University's Mount Pleasant campus at:  
2625 Denison Drive  
Mount. Pleasant, Michigan 48858

This is a construction project supported through the Public Works and Economic Adjustment Assistance program under Section 201 and 209 of the Public Works and Economic Development Act (PWEDA) as amended, 42 U.S.C. 3141 and 3149.

This project includes, but is not limited to the following:

Construction of interior renovations to support multi-tenant spaces within the Central Michigan University Research Corporation (CMURC) business incubator facility in Mount Pleasant, located at 2625 Denison Drive, Mount Pleasant, MI 48858. This approximate 11,500 square foot renovation will provide consistent architecture and interior design compared to the recently renovated CMURC spaces in Midland (801 Joe Mann Blvd., Suite P, Midland, MI 48642) and Saginaw (203 S. Washington Ste 260, Saginaw, MI 48602).

This 11,489 square foot renovation will include:

- Demolition of existing office space and toilet rooms.
- Reconfiguration of office space throughout to meet the users' current needs and future growth.
- Creation of a public café area.
- Installation of modular walls, doors and finishes, provide flexibility for future incubator tenants.
- Relocation of utilities including HVAC, plumbing, electrical, lighting, fire alarm, fire suppression and IT infrastructure.

Contractor shall ensure compliance with the following:

- The Davis-Bacon Act, as amended (40 U.S.C. §§ 3141, 3146, 3147; 42 U.S.C. § 3212),

### ADDITIONS AND DELETIONS:

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

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

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

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

- The Contract Work Hours and Safety Standards Act, as amended (40 U.S.C. §§ 3701-3708),
- The National Historic Preservation Act of 1966, as amended (54 U.S.C. § 300101 et seq.), and the Advisory Council on Historic Preservation Guidelines (36 CFR part 800),
- Preservation of Historical and Archaeological Data (54 U.S.C. § 312502),
- The Architectural Barriers Act of 1968, as amended (42 U.S.C. § 4151 et seq.),
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. § 4601 et seq.),
- The Energy Conservation and Production Act (42 U.S.C. § 6834 et seq.), Executive Order 13717, "Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction",
- Compliance with Local Construction Requirements.
- DOC stand Terms and Conditions "Non-Discrimination Requirements"
- Lobbying Restriction Form CD-512
- EEO and Affirmative Action EEO Requirements
- Contract Provisions for Non-Federal Entity Contracts under Federal Awards

The Architect:

*(Name, legal status, address and other information)*

Neumann/Smith Architecture  
400 Galleria Officentre / Suite 555  
Southfield, Michigan 48034

The Owner and Contractor agree as follows.

## TABLE OF ARTICLES

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

## EXHIBIT A INSURANCE AND BONDS

### ARTICLE 1 THE CONTRACT DOCUMENTS

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

### ARTICLE 2 THE WORK OF THIS CONTRACT

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

### ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

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

*(Check one of the following boxes.)*

☒ The date of this Agreement.

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

☐ Established as follows:

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

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

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

#### § 3.3 Substantial Completion

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

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

By the following date: **December 2, 2024**

§ 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**

Entire Work

**Substantial Completion Date**

December 2, 2024

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

**§ 3.4 PROJECT SCHEDULE**

§ 3.4.1 Contractor shall provide the preliminary project schedule at the first progress meeting referred hereto as **Schedule 3.4.1** (the "Project Schedule") outlining the progress of the Work. The Project Schedule accounts for the requirement that any noisy or disruptive portions of the Work will be completed by the Contractor between 7:00 am and 7:00 pm, Monday through Friday, or on weekends.

§ 3.4.2 The Contractor shall periodically update the Project Schedule for the Architect's review and the Owner's acceptance. The Contractor shall obtain the Architect's approval for the portion of the Project Schedule relating to the performance of the Architect's services as applicable. The Contractor shall coordinate and integrate the schedule with the services and activities of the Owner, Contractor, Architect, and Owner's consultants, and identify items that could affect the Project's timely completion. The Project Schedule shall indicate proposed activity sequences and durations, milestone dates for receipt and approval of pertinent information, preparing and processing of shop drawings and samples, delivery of materials or equipment requiring long-lead time procurement, Owner's occupancy requirements showing portions of the Project completion.

§ 3.4.3 If the schedule updates indicate that previously approved schedules may not be met, the Contractor shall make appropriate recommendations to the Owner. The updated schedules shall be consistent with the preliminary schedule.

§ 3.4.4 The Contractor will use its best efforts to revise the Project Schedule and reallocate the appropriate work forces in a manner to avoid incurring additional expenses or extending the date for Substantial Completion. In no event shall the Contractor incur any additional expense or extend the schedule without the prior consent of the Owner, or in those instances where circumstances arise which entitle the Contractor to relief (as specified herein), without prior notice and submission of a written claim (as defined in the General Conditions) to the Owner.

§ 3.5 The Contractor shall begin the Work on the Date of Commencement and shall perform the Work diligently, expeditiously, and with adequate resources so as to complete all the Work within the Contract Time and in accordance with the Project Schedule. The Contractor shall resequence or reschedule the Work, to the extent possible, to avoid or minimize any delay to the Contract Time.

If, in the reasonable opinion of the Owner, the Work falls behind schedule, so that the Owner is concerned about the Contractor's ability to achieve Substantial Completion within the Contract Time, the Owner shall provide Contractor with written notice of such concerns and request that Contractor provide the Owner with written assurances and a plan to achieve Substantial Completion within the Contract Time within seven (7) days. If after the Owner is, in its reasonable opinion, unsatisfied with the Contractor's response, the Owner may terminate this Agreement pursuant to Paragraph 14.2 of the AIA Document A201-2017, as amended by the Owner.

**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 « TBD » (\$ « TBD »), subject to additions and deductions as provided in the Contract Documents.

**§ 4.2 Alternates**

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

**Item**

TBD

**Price**



§ 4.2.2 Intentionally Deleted.

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

Item	Price
TBD	

§ 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)
TBD		

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

The Contractor agrees that time is of the essence of this Contract and Contractor will achieve Substantial Completion on or before December 2, 2024. Should the Contractor fail to achieve Substantial Completion on or before the foregoing date, it is agreed \$1,500 will be deducted from the Contract Sum for each and every calendar day after such date until Substantial Completion is achieved. It is also understood and agreed that this deduction from the Contract Sum is not a penalty but represents Liquidated Damages suffered by the Owner and is so fixed on a per diem basis because of the extreme difficulty in ascertaining the true and full amount of damages the Owner will sustain if the work under this Contract is not Substantially Complete by the stated date. Contractor agrees that these Liquidated Damages are reasonable for this Project.

## ARTICLE 5 PAYMENTS

### § 5.1 Progress Payments

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

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

§ 5.1.3 Provided that a notarized 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 within thirty (30) days of receipt. If a notarized Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner not later than thirty ( 30 ) days after the Architect receives the notarized Application for Payment.

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

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

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

§ 5.1.6 In accordance with AIA Document A201™-2017, General Conditions of the Contract for Construction, as amended by Owner, 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; and

- .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.

§ 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 as amended by Owner;
- .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 as amended by Owner; 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.)*

Ten percent (10%)

§ 5.1.7.1.1 The following items are not subject to retainage:

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

N/A

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

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

N/A

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

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

Notwithstanding the foregoing, so long as there are no then existing defaults under the Contract Documents, upon written request to the Owner by the Contractor, the Owner shall release retainage as follows: at such time as a particular portion of the Work or the Work of a particular subcontractor of the Contractor (a) is fully completed, (b) has been inspected and approved by the Owner, (c) the Owner has received and approved a final engineering report indicating that such Work has been fully and satisfactorily completed in accordance with the Contract Documents, and (d) if necessary, has been inspected and approved by any required authorities having jurisdiction, then the retainage held for that particular portion of the Work or subcontractor shall be reduced to five percent (5%) or the value, as determined by the Owner, of close-out documentation required by the Contract Documents, including but not limited to as-built documentation, record drawings, operating and maintenance manuals, trainings, and warranties not yet received by the Owner, whichever is greater. Upon fulfillment of the above requirements and Owner's receipt of the abovementioned close-out documentation, the remaining retainage held with respect to a particular subcontractor of the Contractor shall be released to the Contractor.

§ 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, as amended by Owner.

§ 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, less any deduction authorized by Section 4.5 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 as amended by Owner, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

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

## § 5.3 Interest

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

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

0 %

## 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 as amended by Owner, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.

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

### § 6.2 Binding Dispute Resolution

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

*(Check the appropriate box.)*

The Contractor agrees that if there is any mediation involving the Project, the Contractor waives all objections to joinder of the Contractor or any other party as a party to any mediation related to this Project in which the Owner is a party or is joined or is otherwise positioned as a party and in which the Contractor's conduct or its work is in any way relevant to the subject of the dispute. The Contractor also agrees to prepare or modify all contracts and subcontracts used or prepared by the Contractor, including, but not limited to, Supplemental Conditions for Construction for this Project, to conform to this subparagraph.

☒ [ X ] Litigation in a court of competent jurisdiction

Litigation of any claim or dispute arising under or relating to the Contract shall only be brought in either the Michigan Court of Claims, or the United States District Court for the Eastern District of Michigan, as may be permitted, and the parties consent to such jurisdiction and venue. However, this paragraph shall not be construed as a waiver of any immunity granted under state or federal law, including, but not limited to, governmental or sovereign immunity.

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, as amended by Owner.

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

## ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017, as amended by Owner, 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)

Mary M. Hill shall be the Owner's Representative for all contractual issues.  
The CMU Project Manager, Phil Tanner shall be the Owner's Representative for day-to-day interactions and operational decisions.

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

TBD

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior written 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, as amended by Owner, 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, as amended by Owner, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, as amended by Owner may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, as amended by Owner, 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 Notices. All notices or other communications hereunder to either party shall be (1) in writing, and, if mailed, shall be deemed to have been given on the earlier of actual receipt by the intended recipient or on the third business day after the date when deposited in the United States mail by registered or certified mail, postage pre-paid, or by personal delivery, Federal Express or other recognized and reputable overnight courier, addressed as hereinafter provided, and (2) addressed as follows:

If to Owner:

Central Michigan University  
Combined Services Building 206  
Mt. Pleasant, MI 48859  
Attn: Phil Tanner

If to Contractor:

TBD

\_\_\_\_\_  
\_\_\_\_\_  
Attn: \_\_\_\_\_

or to either party at such other address as such party may designate, in a notice to the other party given pursuant to the terms above.

**§ 8.8 Relationship.** The Contractor shall at all times act as an independent contractor, and nothing in the Contract Documents is intended or shall be construed as creating any other relationship or designating Contractor as an agent for or joint venturer with Owner. Contractor shall at all times be responsible for the actions and omissions of the subcontractors, suppliers and other persons and entities performing the Work or any part thereof.

**§ 8.9 Responsibility for Performance of Subcontractors.** After the award of each contract or subcontract, Contractor shall assume full responsibility to Owner for the completion of the contracts within the Project Schedule and for the price set forth in the contract or subcontract, subject only to change orders approved by Owner, which approval shall not be unreasonably withheld.

**§ 8.10 Record Drawings.** Contractor shall maintain at the Project Site, and shall make available to Owner, one record copy of as-built or record drawings (the "Record Drawings") in good order. The Record Drawings shall be marked to show: (1) deviations from the Contract Documents made during construction; (2) the actual installed position of equipment, piping, conduits, light switches, electric fixtures, circuiting, ducts, dampers, access panels, control valves, drains, openings, and stub-outs; and (3) such other information as Owner may reasonably request. At the completion of the work, Contractor shall deliver the Record Drawings to Owner and Architect. Final payment and any retainage shall not be due and owing to Contractor until the final Record Drawings marked by Contractor as required above are delivered to Owner.

**§ 8.11 Work to Conform with Applicable Laws.** Contractor shall perform the Work in accordance with and the Project shall meet all applicable laws, ordinances, codes, rules, and regulations as they apply to means, methods, sequences and techniques for which Contractor is responsible.

**§ 8.12 Contract Sum and Limitation of Damages.** The Owner agrees to pay and the Contractor agrees to accept the sum set forth in the Contract Sum as full compensation for all labor, supervision, equipment, home office and field overhead, materials, administrative and incidental expense required in executing all of the work provided for in this contract and set forth in the plans and specifications, including all loss or damage arising out of the work, as impacted by the elements or from any obstruction, delay or difficulties which may be encountered, subject to the other provisions of the Contract Documents relating to claims and insurance. It is further agreed that the Work may be modified, in nature or scope, and that the Contract Sum may likewise be modified only in accordance with the Contract Documents. No claims for extra compensation or adjustments in the Contract Sum will be made by the Contractor on account of any delays or costs incurred as a result of variations within the Project Schedule to the extent caused by the Contractor, its subcontractors, agents or others for which Contractor is responsible.

**§ 8.13 Approvals.** The Contractor shall secure and pay for all required approvals, permits, assessments and charges required for the construction, use or occupancy or permanent changes in existing facilities, with the exception of the environmental review and the site plan fee, if any, the cost of which shall be borne by Owner.

**§ 8.14 Obstructions.** Mechanical and electrical drawings are not intended to show exact physical locations. Thus, the Contractor shall make all installations clear of any and all obstructions and notify the Owner prior to making any changes from the locations shown in such drawings. The Contractor will be responsible for the coordination of all subcontractor work. In addition, the Contractor will prepare coordinated drawings for all trades. The Contractor is to coordinate and fit all the work.

**§ 8.15 Meetings.** Job meetings are to be held periodically in accordance with the Scope of Work.

**§ 8.16 Controlled Substances.** No drugs, tobacco, alcohol or any other controlled substance will be allowed on the campus of Central Michigan University.

**§ 8.17 Equipment.** Contractor will not use its own or affiliated company's sales and rentals departments to purchase or lease equipment for the project, unless approved in writing by the Owner.

**§ 8.18 Removal of Employee.** The Owner may request the removal and substitution of any person employed by the Contractor without cause.

**§ 8.19 Daily Log.** The Contractor's superintendent shall keep a daily log of information which shall include, but not limited to the following:

1. Number of individuals working on the project by trade.
2. Problems
3. Disputes
4. Accident (with details and witnesses)
5. Delays
6. Material and/or labor shortages.
7. Daily progress.
8. Overtime work (with explanation)
9. Weather conditions.
10. Names of visitors to the site.

## **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, as amended by Owner
- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, as amended by Owner
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction, as amended by Owner
- .4 Drawings

Number	Title	Date
A001	TITLE SHEET	4/28/2023
A002	ARCHITECTURAL DRAWING STANDARDS	4/28/2023
A051	PARTITION TYPES	4/28/2023
A011	CODE COMPLIANCE DATA	4/28/2023
AD011	DEMOLITION FLOOR PLAN	4/28/2023
AD012	DEMOLITION REFLECTED CEILING PLAN	4/28/2023
A031	FINISH KEY	4/28/2023
A041	DOOR SCHEDULE	4/28/2023
A111	FIRST FLOOR PLAN	4/28/2023
A112	FIRST FLOOR ENLARGED PLANS	4/28/2023
A121	MEZZANINE PLAN	4/28/2023
A311	INTERIOR ELEVATIONS	4/28/2023
A351	INTERIOR SECTION DETAILS	4/28/2023
A361	MILLWORK DETAILS	4/28/2023
A3622	INTERIOR PLAN DETAILS	4/28/2023
A401	ENLARGED TOILET PLANS	4/28/2023
A611	FIRST FLOOR REFLECTED CEILING PLAN	4/28/2023
A711	FIRST FLOOR FINISHED PLAN	4/28/2023
A712	FIRST FLOOR FURNITURE PLAN	4/28/2023
S.001	STRUCTURAL GENERAL NOTES AND SYMBOLS	4/28/2023
S.003	STRUCTURAL SPECIAL INSPECTION	4/28/2023
S.101	STRUCTURAL PLANS AND DETAILS	4/28/2023
PD001	FIRST FLOOR ENLARGED PLUMBING DEMOLITION PLAN	4/28/2023
PD101	FIRST FLOOR ENLARGED PLUMBING PLAN	4/28/2023
M001	MECHANICAL STANDARDS AND DRAWING INDEX	4/28/2023



M002	MECHANICAL SCHEDULES	4/28/2023
MD401	FIRST FLOOR ENLARGED SHEET METAL DEMO PLAN	4/28/2023
M401	FIRST FLOOR ENLARGED SHEET METAL PLAN	4/28/2023
M601	MECHANICAL DETAILS	4/28/2023
M701	TEMPERATURE CONTROL STANDARDS & GENERAL NOTES	4/28/2023
E001	ELECTRICAL STANDARDS AND DRAWING INDEX	4/28/2023
E002	ELECTRICAL STANDARD SCHEDULES	4/28/2023
ED101	FIRST FLOOR ENLARGED LIGHTING DEMOLITION PLAN	4/28/2023
ED201	FIRST FLOOR ENLARGED POWER DEMOLITION PLAN	4/28/2023
E101	FIRST FLOOR ENLARGED LIGHTING PLAN	4/28/2023
E201	FIRST FLOOR ENLARGED POWER PLAN	4/28/2023
E501	ONE LINE DIAGRAM	4/28/2023
E502	ONE LINE DIAGRAM	4/28/2023
E503	ONE LINE DIAGRAM	4/28/2023
E701	LIGHTING SCHEDULES & ELECTRICAL DETAILS	4/28/2023
E702	LIGHTING SCHEDULES & ELECTRICAL DETAILS	4/28/2023

## .5 Specifications

Section	Title	Date	Pages
SECTION 00 0101	PROJECT TITLE SHEET	4/28/2023	2
SECTION 00 0107	SEALS PAGE	4/28/2023	4
SECTION 00 0110	TABLE OF CONTENTS	4/28/2023	3
SECTION 00 1000	INVITATION TO BID AND BID INSTRUCTION	4/28/2023	6
	U.S EDA CONTRACTING PROVISIONS (OMB: 0610-0096)	4/28/2023	24
		4/28/2023	2
SECTION 00 2000	PROJECT MANUAL TABLE OF CONTENTS	4/28/2023	4
SECTION 004100	BID FORM	4/28/2023	1
SECTION 00 4100.10	SUPPLEMENT A – LIST OF ALTERNATES	4/28/2023	20
SECTION 00 5000	FORM OF AGREEMENT – AIA DOCUMENT A101 – 2017, A101-2017 Exhibit A	4/28/2023	22
SECTION 00 7000	GENERAL CONDITIONS – AIA DOCUMENT A201 – 2017	4/28/2023	15
SECTION 00 9000	DAVIS BACON WAGE RATES	4/28/2023	
	FORM CD-512 - CERTIFICATION REGARDING LOBBYING LOWER TIER COVERED TRANSACTIONS	4/28/2023	1
	NOTICE OF REQUIREMENTS FOR AFFIRMATIVE ACTION (EXECUTIVE ORDER 11246 AND 41 CFR PART 60-4)	4/28/2023	1
SECTION 01 1000	SUMMARY	4/28/2023	9
SECTION 01 2300	ALTERNATES	4/28/2023	2
SECTION 01 3000	ADMINISTRATIVE REQUIREMENTS	4/28/2023	15
SECTION 01 4000	QUALITY REQUIREMENTS	4/28/2023	4
SECTION 01 4216	DEFINITIONS	4/28/2023	4
SECTION 01 5000	TEMPORARY FACILITIES AND CONTROLS	4/28/2023	8
	EDA SITE SIGN (OMB: 0610-0096)	4/28/2023	5
SECTION 01 7329	CUTTING AND PATCHING	4/28/2023	3
SECTION 01 7700	CLOSEOUT PROCEDURES	4/28/2023	2
SECTION 02 4119	SELECTIVE STRUCTURE DEMOLITION	4/28/2023	4
SECTION 05 1200	STRUCTURAL STEEL FRAMING	4/28/2023	4
SECTION 05 4000	COLD-FORMED METAL FRAMING	4/28/2023	7

SECTION 06 1000	ROUGH CARPENTRY	4/28/2023	5
SECTION 06 4023	INTERIOR ARCHITECTURAL WOODWORK	4/28/2023	6
SECTION 07 8400	FIRESTOPPING	4/28/2023	13
SECTION 07 9200	JOINT SEALANTS	4/28/2023	6
SECTION 08 0671	DOOR HARDWARE SCHEDULE	4/28/2023	2
SECTION 08 1113	HOLLOW METAL DOORS AND FRAMES	4/28/2023	5
SECTION 08 1416	FLUSH WOOD DOORS	4/28/2023	3
SECTION 08 7100	DOOR HARDWARE	4/28/2023	8
SECTION 08 8000	GLAZING	4/28/2023	8
SECTION 08 8300	MIRRORS	4/28/2023	2
SECTION 09 2116	GYPSUM BOARD ASSEMBLIES	4/28/2023	11
SECTION 09 3000	TILING	4/28/2023	8
SECTION 09 5100	ACOUSTICAL CEILINGS	4/28/2023	3
SECTION 09 6500	RESILIENT FLOORING	4/28/2023	5
SECTION 09 6813	TILE CARPETING	4/28/2023	4
SECTION 09 6900	ACCESS FLOORING	4/28/2023	3
SECTION 09 8430	SOUND-ABSORBING WALL AND CEILING UNITS	4/28/2023	3
SECTION 09 9100	PAINTING	4/28/2023	7
SECTION 10 1443	INTERIOR SIGNAGE	4/28/2023	3
SECTION 10 2113.19	PLASTIC TOILET COMPARTMENTS	4/28/2023	3
SECTION 10 2219	DEMOUNTABLE PARTITIONS	4/28/2023	3
SECTION 10 2241	OPERABLE GLASS PARTITIONS	4/28/2023	4
SECTION 10 2800	TOILET ACCESSORIES	4/28/2023	3
SECTION 20 0500	MECHANICAL GENERAL REQUIREMENTS	4/28/2023	10
SECTION 20 0510	BASIC MECHANICAL MATERIALS AND	4/28/2023	16
SECTION 20 0529	METHODS HANGERS AND SUPPORTS	4/28/2023	12
SECTION 20 0553	MECHANICAL IDENTIFICATION	4/28/2023	6
SECTION 20 0700	MECHANICAL INSULATION	4/28/2023	20
SECTION 21 1100	FIRE-SUPPRESSION SYSTEM	4/28/2023	14
SECTION 22 0523	GENERAL DUTY VALVES FOR PLUMBING	4/28/2023	6
SECTION 22 1116	DOMESTIC WATER PIPING	4/28/2023	8
SECTION 22 1316	SANITARY WASTE AND VENT PIPING	4/28/2023	8
SECTION 22 4200	PLUMBING FIXTURES	4/28/2023	10
SECTION 23 0500	COMMON WORK RESULTS FOR HVAC	4/28/2023	4
SECTION 23 0593	TESTING, ADJUSTING, AND BALANCING	4/28/2023	10
SECTION 23 3113	METAL DUCTS	4/28/2023	12
SECTION 23 3116	NON-METAL DUCTS	4/28/2023	8
SECTION 23 3300	DUCT ACCESSORIES	4/28/2023	8
SECTION 23 3713	DIFFUSERS, REGISTERS, AND GRILLES	4/28/2023	2
SECTION 26 0010	ELECTRICAL GENERAL REQUIREMENTS	4/28/2023	8
SECTION 26 0519	CONDUCTORS AND CABLES	4/28/2023	6
SECTION 26 0526	GROUNDING AND BONDING	4/28/2023	4
SECTION 26 0529	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS	4/28/2023	4
SECTION 26 0533	RACEWAYS AND BOXES	4/28/2023	6
SECTION 26 0553	ELECTRICAL IDENTIFICATION	4/28/2023	6
SECTION 26 0923	LIGHTING CONTROL DEVICES	4/28/2023	6



SECTION 26 0943	LIGHTING CONTROL SYSTEMS	4/28/2023	10
SECTION 26 2416	PANELBOARDS	4/28/2023	8
SECTION 26 2726	WIRING DEVICES	4/28/2023	6
SECTION 26 2816	ENCLOSED SWITCHES AND CIRCUIT BREAKERS	4/28/2023	8
SECTION 26 5119	LED INTERIOR LIGHTING	4/28/2023	10
SECTION 26 5700	LUMINAIRE PRODUCT DATA	4/28/2023	68
SECTION 28 3100	FIRE ALARM	4/28/2023	8

**.6 Addenda, if any:**

Number	Date	Pages
TBD		

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.

**.7 Other Exhibits:**

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

☐ AIA Document E204™-2017, Sustainable Projects Exhibit, as amended by Owner and 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
CMURC RFP for Construction Services	CMURC Rural Rescue Impact Plan – Isabella Transformation (RRIP-IT) Award #: 06-01-06375 URI: 117640 Request for Proposal For Construction Services	April 28, 2023	66

**.8 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.)*

- U.S. Department of Commerce, Economic Development Administration – EDA Contracting Provisions for Construction Projects, Expiration Date 01/31/2025
- U.S. Department of Commerce, Economic Development Administration – Standard Terms

Central Michigan University Design Standards located at: <https://www.cmich.edu/offices-departments/finance-administrative-services/facilities-management/university-engineering-and-planning/design-standards>

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

CENTRAL MICHIGAN UNIVERSITY

TBD

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

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

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

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

# 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 **TBD** day of **TBD** in the year **2023**  
(In words, indicate day, month and year.)

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

CMURC Rural Rescue Impact Plan – Isabella Transformation (RRIP-IT)  
Award #: 06-01-06375  
This project is located on Central Michigan University's Mount Pleasant campus at:  
2625 Denison Drive  
Mount. Pleasant, Michigan 48858

**THE OWNER:**  
(Name, legal status and address)  
Central Michigan University  
Mt. Pleasant, MI 48859

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

**TBD**

#### 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, as amended by Owner.

#### 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 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.

#### 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.

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

## § A.2.2 Liability Insurance

The Owner shall be responsible for self-insuring or purchasing, and maintaining the Owner's usual general liability insurance.

## § 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, "all-risks" property insurance written on a completed value 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 mortgagees as loss payees. The policy shall insure the interest of Contractor and subcontractors in insured property during construction at an insured location or within 1,000 feet thereof, to the extent of the Owner's legal liability for insured physical loss or damage to such property. Such interest of Contractor and subcontractors is limited to the property for which they have been hired to perform Work and such interest will not extend to any time element coverage provided under such policy.

§ 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.

§ A.2.3.1.2 **Specific Required Coverages.** The insurance required by this Section A.2.3.1 shall 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 follows:  
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit
----------	-----------

§ A.2.3.1.3 Intentionally Deleted.

§ 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 Owner shall be responsible for all loss not covered because of such deductibles or retentions, provided that in the event of losses caused by the acts, errors, or omissions of the Contractor, its subcontractors, or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, the Contractor shall be fully responsible for the deductible or the amount of the self-insured retention, as the case may be.

§ A.2.3.2 Intentionally Deleted.

## § 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 Intentionally Deleted.

§ A.2.5 Intentionally Deleted.

## 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 acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) upon award of the Contract and 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. The Contractor shall not commence Work under this Contract until all insurance is obtained and approved by Owner, nor shall the Contractor allow any Subcontractor to commence Work pursuant to subcontracts until all similar insurance required to be carried by the Subcontractor has been so obtained and approved. 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 and its Board of Trustees, public officials, officers, employees, and agents as an additional insured on the Contractor's Commercial General Liability, automobile liability, and excess or umbrella liability policy or policies.

**§ 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.

**§ 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 and its Board of Trustees, public officials, officers, employees, and agents, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's acts or omissions during the Contractor's operations; and (2) the Owner and its Board of Trustees, public officials, officers, employees, and agents as additional insureds for claims caused in whole or in part by the Contractor's 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 general liability 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 with a minimum Best's rating of A-XII, approved in advance by the Owner, and lawfully authorized to issue insurance in the jurisdiction where the Project is located. Such insurance policies shall also incorporate a provision requiring written notice to the Owner at least thirty (30) days prior to any cancellation, nonrenewal, or material modification of the policy. By requiring such minimum insurance coverage, Owner shall not be deemed or construed to have assessed the risk that may be applicable to the Contractor under the Contract Documents. Contractor shall assess its own risks, and if it deems appropriate and prudent, Contractor shall maintain higher limits and broader coverage. Contractor is not relieved of any liability or other obligations assumed or pursuant to the Contract Documents by reason of its failure to obtain or maintain insurance in sufficient amounts, duration, or types. 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

**§ A.3.2.2.1** Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than One Million Dollars (\$1,000,000) each occurrence, Two Million Dollars (\$2,000,000) general aggregate, and Two Million Dollars (\$2,000,000) aggregate for products-completed operations hazard, providing coverage for claims including

- .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 with Pollution and Legal Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than **One Million Dollars** (\$1,000,000) 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 at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than **One Million Dollars** (\$1,000,000) each accident, **One Million Dollars** (\$1,000,000) each employee, and **One Million Dollars** (\$1,000,000) policy limit. Coverage under the Employers' Liability policy shall include an Alternate Employer Endorsement naming Owner as an alternate employer.

§ 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 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 per the table below:

Owner's Estimated Project Budget	Minimum Professional Liability
Less than \$10 million	\$2 million
\$10-\$20 million	\$3 million
\$20-\$40 million	\$4 million
Greater than \$40 million	\$10 million



Any and all limits shall be considered available to support the indemnification obligations set forth in this Agreement. The Professional Liability policy shall contain a waiver of subrogation in favor of the Owner and its Board of Trustees, officers, employees, agents, and volunteers.

§ A.3.2.9 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 **Two Million Dollars** (\$2,000,000) per claim and **Four Million Dollars** (\$4,000,000) in the aggregate.

§ A.3.2.10 Intentionally Deleted.

§ A.3.2.11 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 **TBD** » (\$ « » ) per claim and «**TBD**» (\$ « » ) in the aggregate. – Not required.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than «**TBD**» (\$ « » ) per claim and «**TBD**» (\$ « » ) in the aggregate. – Not required.

§ A.3.2.13 Owner reserves the right to review the Contractor's insurance requirements contained in this Exhibit during the effective period of the Contract and any extension or renewal thereof, and to adjust the required insurance coverages and limits when deemed necessary and prudent based on changes in statutory law, court decisions, or the claims history of the industry, as well as the Contractor.

### § A.3.3 Contractor's Other Insurance Coverage

§ 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	100% of the Contract Sum
Performance Bond	100% of the Contract Sum

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

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

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

Contractor shall require each Subcontractor and each supplier providing field services for the Project to obtain liability insurance as is required of the Contractor with limits appropriate to the subcontracted Work and potential perils, but not less than \$1,000,000, each occurrence and aggregate. Such insurance policies shall be endorsed to list as additional insureds, the Contractor, Owner, Architect, and the Owner’s other consultants, including their respective subsidiaries and affiliates, and their respective directors, officers, shareholders, agents, and employees.



## **SECTION 00 7000 – GENERAL CONDITIONS**

### **FORM OF GENERAL CONDITIONS**

- 1.1** The General Conditions included in these Contract Documents are to set forth various requirements of the University before and after award of Contract. The General Conditions along with Instructions to bidders shall establish the responsibility and relationship of all parties involved in the Contract.
- 1.2** The work under this Contract is subject to all the requirements of the “General Conditions of the Contract for Construction”, AIA Document A201 - 2017 Edition, as Amended by Owner.

**END OF SECTION 00 7000**

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# DRAFT AIA® Document A201™ – 2017

## General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

CMURC Rural Rescue Impact Plan – Isabella Transformation (RRIP-IT)  
Award #: 06-01-06375  
Central Michigan University  
Central Michigan University Research Corporation  
2625 Denison Drive  
Mt. Pleasant, MI 48858

THE OWNER:

(Name, legal status and address)

Central Michigan University  
Mt. Pleasant, MI 48859

THE ARCHITECT:

(Name, legal status and address)

Neumann/Smith Architecture  
400 Galleria Officentre / Suite 555  
Southfield, Michigan 48034

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#### ADDITIONS AND DELETIONS:

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

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

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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## **ARTICLE 1 GENERAL PROVISIONS**

### **§ 1.1 Basic Definitions**

#### **§ 1.1.1 The Contract Documents**

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

In general, the Drawings shall show dimensions, positions, materials and kinds of construction; the Specifications shall describe quality of materials, workmanship and methods. Work called for on the Drawings and not mentioned in the Specifications, or vice versa, shall be performed as though fully set forth in both. Work not particularly detailed, marked or specified shall be the same as similar parts that are detailed, marked or specified. The Contractor acknowledges that the Owner may be separately performing portions of the work for the Project. If the Contractor discovers errors or defects in work performed by the Owner or by others, the Contractor shall at once notify the Owner. After consulting with the Owner with respect to such error, the Architect, Contractor and Owner shall work cooperatively to correct any such error and determine how to proceed. If the Contractor proceeds with the Work after the discovery of an error without written approved instructions from the Architect or the Owner, the Contractor shall make good any resulting damage or defects. This includes Specification typographical errors and Drawing notational errors where the Contractor reasonably believes that an error exists.

#### **§ 1.1.2 The Contract**

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

#### **§ 1.1.3 The Work**

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

#### **§ 1.1.4 The Project**

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

#### **§ 1.1.5 The Drawings**

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

#### **§ 1.1.6 The Specifications**

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

#### **§ 1.1.7 Instruments of Service**

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

### **§ 1.1.8 Initial Decision Maker**

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

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

**§ 1.2.1** The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results. Therefore the Contractor shall be required to furnish and/or otherwise perform in accordance with the higher and better quality, as determined by the Owner, or shorter duration of performance or non-continuous, interrupted sequence of the Work, if required, at no additional cost or liability to the Owner.

**§ 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 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 Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of any reserved rights therein held by others.

**§ 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 or the Agreement, 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 may 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 Contractor/Construction Manager**

If the Owner is using a Construction Manager on the Project instead of a general contractor, the term "Contractor" when used in this document shall mean "Construction Manager".

# **ARTICLE 2 OWNER**

## **§ 2.1 General**

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

**§ 2.1.2** Intentionally Deleted.

**§ 2.2** Intentionally Deleted.

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

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

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

**§ 2.3.3** If the employment of the Architect terminates, the Owner shall employ a successor whose status under the Contract Documents shall be that of the Architect.

**§ 2.3.4** The Owner, if necessary, shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site.

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

**§ 2.3.6** Upon the written request of the Contractor, 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 promptly correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such



order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.

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

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

## **ARTICLE 3 CONTRACTOR**

### **§ 3.1 General**

**§ 3.1.1** The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction 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 and in a good and workmanlike manner.

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

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

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

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

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

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

Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

### **§ 3.3 Supervision and Construction Procedures**

**§ 3.3.1** The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written 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 Contract 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. The Contractor shall ensure that all work is done in a good and workmanlike manner.

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

### **§ 3.4 Labor and Materials**

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

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

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

### **§ 3.5 Warranty**

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

**§ 3.5.2** All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4. The Contractor agrees to transfer to the Owner before final payment all such transferable warranties and further agrees to perform the Work in such a manner so as to preserve all such warranties.



### § 3.6 Taxes

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

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

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

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

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

### § 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 3 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 in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

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

### § 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

### § 3.9 Superintendent

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

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 10 days of receipt of the information, the Architect may notify the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to provide notice within the 10-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 shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

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

### § 3.11 Documents and Samples at the Site

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

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

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

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

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

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed

in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

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

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

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

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

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

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

**§ 3.12.10.1** If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review 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. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

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

### § 3.13 Use of Site

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

### § 3.14 Cutting and Patching

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

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

### § 3.15 Cleaning Up

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

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

### § 3.16 Access to Work

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

### § 3.17 Royalties, Patents and Copyrights

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

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall defend, indemnify and hold harmless the Owner, its public officials, officers, agents and employees and the Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work by the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18. Nothing in this Section 3.18.1 shall require any indemnification that would make the provisions of this Section 3.18.1 void or unenforceable under applicable law.

§ 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.

§ 3.18.3 The parties hereto understand and agree that the Owner is relying on, and does not waive or intend to waive by any provision of this Contract, any monetary limitations or any other rights, immunities, and protections provided

by the law of the State of Michigan, as from time to time amended, or otherwise available to the Owner or its Board of Trustees, its officers, employees, agents or volunteers.

## **ARTICLE 4 ARCHITECT**

### **§ 4.1 General**

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

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

### **§ 4.2 Administration of the Contract**

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

**§ 4.2.2** The Architect shall be present while Work is in progress, as often as necessary and appropriate to the stage of construction, to observe the site and Work; to familiarize the Architect with progress and quality of the Work and to determine for the Owner's benefit and protection if the Work is proceeding in accordance with the Contract Documents and construction schedule. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

**§ 4.2.3** On the basis of the site visits, the Architect will keep the Owner informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work. The Architect shall be responsible for any costs incurred by the Owner as a result of the Architect's negligent acts, errors, or omissions in performing its duties and responsibilities under Sections 4.2.2 and 4.2.3.

### **§ 4.2.4 Communications**

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

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

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

**§ 4.2.7** The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be



taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

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

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

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

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

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

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

## ARTICLE 5 SUBCONTRACTORS

### § 5.1 Definitions

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

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

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

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of

receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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

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

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

### **§ 5.3 Subcontractual Relations**

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

### **§ 5.4 Contingent Assignment of Subcontracts**

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

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

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

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

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

## ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces and with Separate Contractors at Owner's sole discretion.

§ 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.

§ 6.1.5 Contractor acknowledges that Owner's own forces or a Separate Contractor will perform work related to the provision of the Information Technology requirements of the Project. Such Separate Contractor's work will occur simultaneous to the Work performed under this Contract. Contractor shall cooperate fully with Owner and the Separate Contractor so that the information technology work may be completed without interference from the Contractor and without interfering with or delaying the Work performed by Contractor under this Contract. Contractor shall coordinate the Work of this Contract with the work to be performed by the Separate Contractor for the Information Technology requirements of this Project. Such coordination shall include, but not be limited to receiving input from Owner and the Separate Contractor regarding the critical path schedule for the Project, including the Separate Contractor in subcontractor meetings, and responding to RFIs submitted by the Separate Contractor (as applicable to the Contractor's Work and obligations hereunder). Nothing herein shall limit the Contractor's obligations with respect to Separate Contractors as set forth elsewhere in this Contract.

### § 6.2 Mutual Responsibility

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

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

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

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



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

### § 6.3 Owner's Right to Clean Up

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

## ARTICLE 7 CHANGES IN THE WORK

### § 7.1 General

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

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect.

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

### § 7.2 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 Methods used in determining adjustments to the Contract Sum may include those listed in Section 7.3.3.

§ 7.2.3 Agreements on any Change Order shall constitute a final settlement and release of all matters relating to the change in the Work which is subject of the Change Order.

### § 7.3 Construction Change Directives

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

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

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

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

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the

Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

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

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

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

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

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

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

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

#### § 7.4 Minor Changes in the Work

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

### ARTICLE 8 TIME

#### § 8.1 Definitions

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

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

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

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

## § 8.2 Progress and Completion

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

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operation on the Work site or elsewhere prior to the effective date of insurance required pursuant to the Agreement to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

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

## § 8.3 Delays and Extensions of Time

§ 8.3.1 Subject to the provisions of Section 15.1.5 hereof, if (a) Work on the critical path as shown on the Project Schedule is delayed at any time by (i) an act or neglect of Owner, any employee of Owner, or any separate contractor employed by Owner, (ii) changes ordered in the Work in accordance with the provisions of Article 7, (iii) unusually severe adverse weather conditions which preclude the safe performance of the Work, (iv) war or national conflicts or priorities arising therefrom, (v) fires beyond the reasonable control of Contractor, (vi) floods beyond the reasonable control of Contractor, (vii) earthquakes, (viii) off-site or area-wide labor disputes which are beyond the reasonable control of Contractor, or (ix) civil disturbances, and for no other cause or causes (collectively, an “Excusable Delay”); (b) Contractor would otherwise have been able to perform its obligations timely under this Agreement but for such delay; (c) Contractor has taken reasonable precautions to foresee, prevent, and mitigate the effects of delays resulting from such causes; (d) the delay to the critical path of the Work exceeds three (3) days; and (e) the Contractor has given written notice thereof to Owner within three (3) days after the event of Excusable Delay occurs, then subject to the provisions of this Section 8.3, the Contract Time shall be appropriately extended by Change Order by the number of working days of delay on the critical path of the Work actually and directly caused by such occurrence. Contractor shall provide a critical path analysis of such delay claim which clearly identifies the effect of such delay on any critical path activities. Such extension of Contract Time shall be net of any delays caused by or a result of the fault or negligence of Contractor or which are otherwise the responsibility of Contractor or its agents or Subcontractors, and shall also be net of any contingency or “float” time allowance included in the Project Schedule. Owner may, at its option, authorize extra Work in order to accelerate the Project Schedule and minimize or eliminate the impact of the delay. Whenever Contractor knows or reasonably suspects that any actual or potential labor dispute is delaying or threatens to delay the timely performance of the work, Contractor shall immediately give notice thereof, including all relevant information with respect thereto, to Architect and Owner. As used herein, the term “critical path” shall mean causing a delay to activities showing no float based on the Contractor’s updated and accepted Project Schedule.

No delay, obstruction, interference, hindrance, or disruption, from whatever source or cause, in the progress of the Work shall be a basis for an extension of time unless the delay, obstruction, interference, hindrance, or disruption is without the fault and not the responsibility of the Contractor and directly affects the critical path, as reflected in the Contractor’s updated and accepted Project Schedule. No delay, obstruction, interference, hindrance, or disruption, from whatever source or cause, in the progress of Contractor’s Work shall be a basis for an extension of time for an interim milestone date, if any, unless the delay, obstruction, interference, hindrance, or disruption is without the fault and not the responsibility of the Contractor and directly affects the overall completion of such interim milestone, as reflected in the Contractor’s updated and accepted Project Schedule.

§ 8.3.2 In the event of disagreement between Contractor and Owner over an equitable extension of time to compensate for an Excusable Delay, then no extension of time will be granted for any of the causes for which extensions are granted unless the Contractor demonstrates to the reasonable satisfaction of the Architect that the Contractor has made every reasonable effort to complete all Work under the Contract not later than the date prescribed, or as soon as possible thereafter, notwithstanding delay in the Work due to any such cause.

§ 8.3.3 Even though the Contractor has no right to an extension of time for completion, the Owner may in the exercise of its sole discretion extend the time at the request of the Contractor if it determines it to be in the best

interest of the Owner.

**§ 8.3.4** The Contractor shall assure that all of its subcontractors and suppliers are bound to a contractual provision providing that they are entitled to no additional compensation or damages on account of delays arising from any cause, other than Owner created Excusable Delay, and shall indemnify Owner from any claims arising from its failure to do so.

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

**§ 8.3.6** To the extent no circumstance has arisen entitling the Contractor to an extension of time pursuant to the Contract Documents, the Contractor falls behind the Project Schedule to such an extent that the Owner reasonably determines that the Contractor will be unable to achieve Substantial Completion by the date set forth in the Project Schedule, as such date may be extended as provided in the Contract Documents, the Contractor shall, within three (3) working days after receipt of notice from Owner, provide to the Owner, in writing, a detailed explanation of the measures the Contractor will take and a recovery schedule in order to recover from the delay so that the progress of the Work complies with the Project Schedule. The Contractor shall work overtime, multiple shifts or take any other action necessary, including increasing its labor force, in order to meet the Project Schedule and achieve Substantial Completion of the Work within the Contract Time. The cost of such action will be borne solely by the Contractor and will not entitle the Contractor to an increase in the Contract Sum except to the extent such additional costs are due to Owner's fault, or for such delay, suspension or interruption pursuant to Section 14.3.2 that exceeds 60 days. Contractor has ability to use Contingency, with Owner's approval, for premium time to maintain or expedite the project schedule. Whenever, in the reasonable opinion of the Owner, the Contractor's recovery schedule will not meet the requirements of the Project Schedule, the Owner may issue a Construction Change Directive instructing the Contractor to increase its labor force and/or provide overtime, Saturday, Sunday, and/or holiday work, and shall have each subcontractor do likewise, all at no additional cost to or compensation from the Owner. Further, the Owner shall have the right to offset against any amounts then or thereafter due to the Contractor, or to be reimbursed by the Contractor for, any additional costs the Owner may incur as a direct result of said increase in labor force or overtime, Saturday, Sunday, and/or holiday work.

**§ 8.3.7** If the Contractor remains behind schedule after seven (7) days written notice from the Owner, the Owner may terminate the Contract for cause under Section 14.2.1, provided, however, the Owner shall not terminate the Contract if Contractor has presented Owner with a written plan, reasonably acceptable to Owner, to recover lost time and achieve Substantial Completion within the Project Time and the Contractor diligently follows such plan.

**§ 8.3.8** Should the Owner be prevented or enjoined from proceeding with Work either before or after the start of construction by reason of any litigation or other reason beyond its control, the Contractor shall not be entitled to make or assert any claim for damage by reason for said delay; but time for completion of the Work will be extended to such reasonable time as the Owner may determine and will compensate the Contractor for time lost by such delay, and/or adjust the Contract Sum for such delay. Any such determinations will be set forth in writing.

## **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, as the Architect may require. 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.

Also with each application for payment, the Contractor shall submit partial conditional waivers of lien, properly executed by Contractor, and each subcontractor or supplier, requesting payment for all materials, labor and/or services included in current request for payment.

Beginning with second application for payment and for all succeeding requests for payment, furnish partial unconditional waivers of lien, properly executed for all materials, labor and services included in previous payment. This will apply to all suppliers and subcontractors who have and/or have not filed notice of furnishings, properly executed for all materials, labor and services included in previous payments.

At time of final application for payment, submit full conditional waivers of lien, properly executed by Contractor and each subcontractor or material man, for all materials, labor and/or services included in final request for payment.

After receipt of final application for payment, submit full unconditional waivers of lien, properly executed by Contractor and each subcontractor or supplier, for full payment of the Contract Sum.

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

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

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

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

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

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

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

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



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

## **§ 9.5 Decisions to Withhold Certification**

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

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

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

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

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

## **§ 9.6 Progress Payments**

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

**§ 9.6.2** The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner. Pursuant to Section 9.6.2.1 below, the Owner may elect to make payments jointly to the Contractor and to the Subcontractor identified on the Contractor's Application for Payment. Payment by the Owner to the Contractor and

Subcontractor jointly shall not create a contractual relationship with the Subcontractor, obligate the Owner to pay the Subcontractor directly in the future, or create contractual rights under the Agreement in the Subcontractor against the Owner.

**§ 9.6.2.1** Upon written notice to the Contractor, the Owner may pay the Subcontractor directly, via joint check, less the amount to be retained under a particular subcontract of the Subcontractor, provided, that Owner shall not make any payments to any Subcontractor with whom Contractor has a bona fide dispute regarding its entitlement to payment and has so notified Owner and for which Contractor has furnished a bond to Owner to cover any such amount in dispute. Owner shall not directly pay any lienor for claims of lien which have been discharged by bond. Contractor shall be a party on all joint or multiple party checks issued by Owner. Endorsement by any payee of a joint or multiple party check shall be deemed payment to that party for the full amount of the check.

**§ 9.6.2.2** The Contractor shall promptly advise the Owner of any claim or demand by a Subcontractor claiming that any amount due to such Subcontractor was not properly paid when due or claiming any default by the Contractor in any of its obligations to such Subcontractor.

**§ 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 thirty (30) 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 mediation, then the Contractor may, upon seven additional days' written 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 written 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 and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no 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 such 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 supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

## **ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY**

### **§ 10.1 Safety Precautions and Programs**

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. Contractor shall provide the Owner with a copy of its most recent and updated Safety Policy, safety programs and site specific operational and safety controls. The Contractor shall be responsible for enforcing the site specific safety program during the construction on the job site. Contractor shall (1) implement for the Project a comprehensive, meaningful and effective safety program designed to encourage safe work habits and practices and reduce the occurrences of accidents and injuries; and (2) require all Subcontractors, consultants, and all other individuals whatsoever on the Project to adhere to Contractor's safety program. Contractor will continuously audit the effective implementation of all safety programs and policies applicable to those activities occurring on the Project. Additionally, the Contractor shall be responsible for enforcing all current OSHA standards for the Project. The Owner shall deny access to the site to anyone who is not on the Contractor's list of approved persons and shall take and will take responsibility for anyone admitted who are not on the list.

### **§ 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-subcontractors; 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. The Contractor must comply with all required safety procedures.

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

**§ 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, Contractor shall first obtain written authorization from the Owner with respect thereto, and 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 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, except 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. This individual shall provide a written report on site safety, activities, incidents, and accidents on a monthly basis. Should there be a reportable incident or accident on the site, the Contractor shall notify the Owner in writing and within 24 hours of when the accident or incident occurred.

**§ 10.2.7** The Contractor shall not overload floors or any part of the construction site and at all times exercise all necessary precautions for the safety of the public and of employees with respect to the Work. The Contractor shall provide, maintain and coordinate the installation of danger signals and other safeguards with the Owner about the Work and shall be held responsible for all accidents or damages to persons or property caused by failure to do so. The Contractor shall comply with all applicable provisions of governing agencies (State, Federal, OSHA and Municipal). All machinery openings, openings, excavations and other physical hazards shall be guarded in accordance with all applicable laws and regulations. In case of conflicts between various laws and regulations, the most stringent restrictions will apply.

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

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of 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.

**§ 10.2.8.1** Contractor agrees to remain responsible for the reasonable preservation and protection of the Work during work stoppages or delays and further agrees to protect the Work from deterioration and/or damage until such time as the Work is accepted by Owner. If such delays or work stoppages are the fault of Contractor, no additional payments will be made by Owner to repair damage or restore deterioration, or otherwise correct deficiencies. Contractor shall protect, as may be affected by execution of the Work, adjoining private or municipal property, including, but not limited to, buildings and structures, foundations, landscaping, parking areas, walkways and underground systems, and shall provide barricades, temporary fences, and covered walkways required to protect the safety of passers-by, as required by local building codes,

ordinances or other laws, or the Contract Documents. Contractor shall, as a Cost of the Work, promptly repair any damage or disturbance to walls, utilities, sidewalks, curbs, exterior alleys, streets, and driveways and the property of third parties (including municipalities) resulting from the performance of the Work, whether by Contractor or its Subcontractors or consultants.

**§ 10.2.8.2** Areas of the Project site which may be used by Contractor are limited and shall be approved by Owner and any authorities having jurisdiction over the site before Contractor commences the Work. Owner shall have the right to reasonably change the location of such areas from time to time upon reasonable notice to Contractor. Further, Contractor acknowledges that areas for parking vehicles and storing equipment and materials at the jobsite are limited. Contractor shall provide adequate supervision and use its best efforts to ensure that no consultant, Subcontractor or other person performing the Work violate any of the foregoing restrictions. In the event utilities are not available at the Project site, Contractor shall make arrangements for and furnish, at Contractor's cost and expense, all water, electricity, lighting and other utilities and equipment as are necessary to complete the Work. If necessary, temporary toilet facilities shall be provided and maintained as a Cost of the Work for the use of all workmen and workwomen on the Project. The temporary toilets shall be located in a reasonable location, subject to Owner's reasonable approval and shall be relocated inside the building or connected to the sewer system serving the Project as soon as work will reasonably and customarily allow. The temporary toilets shall be kept in a sanitary condition at all times. Contractor shall be responsible for obtaining all necessary permits and approvals for the installation and use of the temporary facilities. Contractor shall provide and maintain the site offices and equipment for the Owner and their site staff, as reasonably required by the Owner.

**§ 10.2.3** The Contractor shall, or shall require its Subcontractors and consultants to: (a) be responsible for the adequate strength and safety of all scaffolding, staging and hoisting equipment and for temporary shoring, bracing and tying; (b) furnish approved hard hats, other personal protective equipment as required, approved first aid supplies, the names of two first aid attendants present on each shift and a posted list of emergency facilities and take prompt action to correct any dangerous conditions affecting or that will imminently affect the safety of persons or property reported; and (c) comply with the requirements of all applicable occupational health and safety laws, including all standards and regulations which have been promulgated by the governmental authorities which administer such acts and said requirements, standards and regulations are incorporated herein by reference. The Contractor shall be directly responsible to the Owner for compliance with the provisions of this Section 10.2.3 on the part of its agents, employees, Subcontractors, consultants, and materialmen and shall directly receive and be responsible for all citations, assessments, fines or penalties which may be incurred by reason of the failure of its agents, employees, materialmen, Subcontractors, or consultants to so comply.

**§ 10.2.4** The Contractor shall furnish, install, maintain, remove and pay for all temporary staging end planking, ladders, hoisting including operator, material handling, rigging and safety devices as required for its Work in conformance with all Governmental Requirements. Use of any such devices belonging to the Owner shall not be allowed under any circumstances.

**§ 10.2.5** The Contractor, in all cases, shall comply with all regulatory requirements of EPA and all other Governmental Requirements.

**§ 10.2.6** The term "Governmental Requirements" as used in the Contract Documents shall mean building, zoning, subdivision, traffic, parking, land use, environmental, occupancy, health, accessibility for disabled and other applicable laws, statutes, ordinances, regulations or decrees, of any federal, state, county, municipal or other governmental or quasi-governmental authority or agency pertaining (a) to the Project and the Project Site, or (b) to the use and operation of the Project and the Project Site for their intended purposes.

**§ 10.2.7** The Contractor shall keep on site a number of approved and appropriately sized fire extinguishers for use in the event of an emergency.

**§ 10.2.8** The Contractor shall abide by such rules and instructions as to fire prevention and control as the municipality having jurisdiction may prescribe. The Contractor shall take all necessary steps to prevent its employees and consultants and Subcontractors (and their employees) from destruction and/or damage to the Project Site. The Contractor shall, at all times, provide the proper housekeeping to minimize potential hazards and shall provide approved spark arresters on all engines and flues, as well as adequately sized, fully functional and inspected portable fire extinguishers.

§ 10.2.9 Free access to stand pipe connection shall be maintained at all times during the Work and portable fire extinguishers shall be provided by the Contractor and made conveniently available throughout the Project site. The Contractor shall notify its employees and consultants and Subcontractors of the location of the nearest fire alarm box at all locations where the Work is in progress.

### § 10.3 Hazardous Materials and Substances

§ 10.3.1 The term "Hazardous Materials" as used in the Contract Documents shall include but not be limited to (a) asbestos, (b) petroleum-based chemicals and substances, (c) urea formaldehyde, (d) radon, (e) PCB and (f) any chemical, material, element, compound, solution, mixture, substance or matter of any kind whatsoever which is defined, classified, listed, designated or regulated as hazardous, toxic or radioactive by the statutes, ordinances, codes, regulations, orders or directives of the United States of America, the State of Michigan, any political subdivision of the State of Michigan, any municipal corporation of the State of Michigan and any board, agency, authority or body associated with any of the foregoing or any quasi-governmental body or agency with jurisdiction over the Project. The Contractor is responsible for compliance with any requirements included in the Contractor Documents regarding Hazardous Materials. Contractor shall prepare and submit to Owner appropriate materials management and emergency response procedures covering any Hazardous Materials the Contractor expects to be used in the performance of the Work, which procedures shall be reasonably satisfactory to Owner. Contractor shall comply, and shall cause all Subcontractors and consultants to comply, at all times with such materials management and emergency response procedures, and Governmental Requirements applicable to the Work and the Project Site.

§ 10.3.2 In the event that Contractor or its consultants or Subcontractors encounter in the soil of, or at, the Project Site, materials reasonably believed to be Hazardous Materials, including those which are brought to the Project Site by Contractor or its Subcontractors or consultants, in levels which Contractor reasonably believes are in excess of any applicable standards set forth under the Governmental Requirements, the Contractor shall immediately cause the suspect area to be cordoned off, Work stopped in the vicinity of the affected area, and report the condition to the Owner in person or by phone and shall confirm such report to Owner in writing within 24 hours. The Contractor shall take reasonable precautions to prevent or contain the release, movement, spread or disturbance of such Hazardous Materials and to protect persons and property and shall notify Owner immediately of such actions. The Contractor shall cooperate with the Owner in the coordination and scheduling of any consultant or abatement work in connection with the removal or handling of any Hazardous Materials.

§ 10.3.2.1 The Contractor shall not bring, or permit its consultants or Subcontractors to bring any Hazardous Materials onto the Project Site or to deposit, dispose, place, generate, bury, discharge, manufacture, refine, or treat any Hazardous Materials on or about the Project Site, except to the extent and in such quantities as required to perform the Work. If the Work contemplated hereunder requires the use of or transfer to Owner by Contractor of any chemical substance or mixture, or any material which may generate or release a chemical substance or hazardous mixture, Contractor shall provide, before or with such transfer, a Material Safety Data Sheet (OSHA Form 20 or equivalent) and container labels, which include current, accurate and complete information relating to product hazards and precautions for safe use, as required by Governmental Requirements. To the extent required by applicable Governmental Requirements, Contractor shall have Material Safety Data Sheets (MSDS) for all Hazardous Materials used in the workplace and make them available to employees who are potentially exposed to those Hazardous Materials. The MSDS and other information shall be available at the jobsite with two full copies of all information to be turned over to the Owner as it is received. All Hazardous Materials which must be disposed of or treated, stored, or removed from the Project Site, shall be collected, handled, transported, treated, stored, disposed of or otherwise remediated in accordance with Governmental Requirements.

§ 10.3.3 In the event that Hazardous Materials existed at or adjacent to the Project Site prior to the commencement of the Work or at any time thereafter other than through an act or omission of Contractor, Owner shall be responsible at Owner's expense and the associated Contractor schedule impacts, if any, for arranging for the collection, handling, transportation, treatment, storage and disposal of such Hazardous Materials in accordance with Governmental Requirements. In the event that the Hazardous Materials were introduced at the Project Site by the Contractor or any of its consultants or Subcontractors and which are not to remain at the Project Site as part of the Project, the Contractor at Contractor's expense shall cause others to collect, handle, transport, treat, store and dispose of such Hazardous Materials in accordance with Governmental Requirements. The Contractor shall perform the Work to minimize improper activities by its consultants and Subcontractors in connection with any Hazardous Materials. Contractor shall coordinate the Work with the entities that collect, handle, transport, treat, store and dispose of such Hazardous Materials. Copies of all Hazardous Materials manifests shall be furnished to Owner.

**§ 10.3.4** To the fullest extent permitted by law, Contractor shall indemnify, defend (with counsel acceptable to Owner), protect and hold harmless Owner and its officers, directors, employees and agents from and against any and all claims, costs, expenses (including attorneys' fees and costs), liabilities, penalties or actions arising, directly or indirectly, from the presence on or about the Project Site of any Hazardous Materials brought to the site by the Contractor, any consultant or Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts they may be liable, excepting only such matters as are caused by the negligence or willful misconduct of Owner, or which are a preexisting condition of the Project Site or brought to the Project site by the Owner or a separate contractor of Owner, in which case the Owner shall indemnify and hold harmless the Contractor and its consultants and Subcontractors, and their employees, and agents for all claims, costs, expenses (including fees and costs), liabilities, penalties or actions arising from same. Notwithstanding the foregoing, the Owner shall not be required to indemnify and hold harmless the Contractor, its consultants and Contractors, and their employees, and agents as required above to the extent that such claims, costs, expenses, liabilities, penalties or actions arise from the fault or negligence of any such party. The provisions of this paragraph shall survive the expiration or termination of the Contract Documents.

**§ 10.3.5** Intentionally Deleted.

**§ 10.3.6 Non-Abatement Trade Contractor Responsibilities**

- .1 All Non-Abatement contractors working around asbestos containing materials on the Project Site are required to have a minimum 2 hour asbestos awareness training on the health and safety aspects of asbestos and this training shall have been completed within the past 12 months.
- .2 All Non-Abatement contractors shall not remove any asbestos containing materials during the course of the Project unless properly licensed, trained and insured.

**§ 10.3.6 Asbestos Abatement Trade Contractor Responsibilities**

Contractor shall ensure that only properly licensed and trained contractors will remove asbestos containing materials and they shall meet the requirements below:

- .1 Shall be licensed by the State of Michigan.
- .2 Shall be properly insured to complete asbestos removal work.
- .3 Shall adhere to all state and federal rules, regulations and guidelines when completing work on the campus of Central Michigan University.
- .4 Shall have been in the abatement business a minimum of 5 years.
- .5 Shall fill out and submit after owner sign off the Michigan Department of Environmental Quality (MDEQ), Michigan Department of Licensing and Regulatory Affairs (LARA) Asbestos Program "NOTIFICATION OF INTENT TO REMOVE/DEMOLISH" for projects requiring such communication.

**§ 10.3.7 Air Monitoring Services During Abatement Activities**

- .1 Air monitoring and environmental consultation will be conducted and coordinated by the Owner pursuant to OSHA regulation 29 CFR 1926.1101 during asbestos removal activities.

**§ 10.3.8 Lead Based Coatings**

- .1 All coated surfaces in or on the structure and its systems or subsystems are presumed to contain lead in buildings constructed before 1978.
- .2 Contractors working on the Project Site shall have lead hazard awareness training. The training shall have been conducted within the past 12 months.
- .3 All work which might disturb coatings shall be conducted pursuant to the requirements of the Lead in Construction Standard, 29 CFR 1926.62 and the Michigan Lead Exposure Construction Standard Part 603.
- .4 The cost of air monitoring required by the standard will be borne by the Contractor, but must be carefully coordinated and scheduled with the Owner's representative; the Contractor will share results with the Owner's representative within five (5) days of receipt of documentation.
- .5 Documentation of training, written lead compliance plans and all air monitoring results (and negative exposure assessments) shall be available at the Project Site.



- .6 The EPA requires a Toxicity Characteristic Leachate Procedure (TCLP) test for lead based waste generated during demolition activities and this cost shall be borne by the Owner, if test results reveal the waste as hazardous it shall be disposed of as hazardous material debris instead of general construction debris, the Owner shall bear these costs as well.
- .7 The following buildings were constructed before 1978:

Anspach Hall	Atlanta, MI – WPHN-FM
Beaver Island Boathouse/Mesocosm	Barnes Kitchen
Beaver Island Main Bldg.	Beaver Island Campground
Bohannon School House-Poor Museum	Beddow Hall
Brooks Science Hall	Bovee University Center
Carey Dining Commons	Calkins Hall
Carlin Alumni House	Carey Hall
Cobb Hall	Central Energy Facility
Finch Field House	Emmons Hall
Grawn Hall	Foust Hall
Herrig Hall	Grounds East
Kewadin Village Apts. Total	Kelly/Shorts Stadium
McNeel Nature Ctr. Lodge (Neithercut)	Larzelere Hall
Merrill Hall	Merrill Dining Commons
North Art Studio	Moore Hall & Bush Theatre
Park Library	Northwest Apartments
Powers Hall	Pearce Hall
Robinson Hall	Robinson Dining Commons
Rose Center – Ryan Hall	Ronan Hall
Sault Saint Marie, MI - WCMZ-FM	Rowe Hall
Sloan Hall	Saxe Hall
Special Olympics Center	Smith Hall
Thorpe Hall	Sweeney Hall
Troutman Hall	Trout Hall
University Art Gallery	Tunnel System
Washington Court Apts.	Warriner Hall
Wheeler Hall	West Hall
Woldt Dining Commons	Wightman Hall
Woldt Hall	

## § 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.

§ 10.4.1 Contractor shall provide emergency contacts during all nonbusiness hours to address project and site specific issues from the start of construction to Substantial Completion.

## 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 and its public officials, officers, employees and agents, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

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

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

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

## § 11.2 Owner's Insurance

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

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

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

## § 11.3 Waivers of Subrogation

§ 11.3.1 The Contractor waives all rights against the Owner and any of its agents and employees for damages caused by loss to the extent those losses are covered by insurance maintained by the Contractor or other insurance applicable to the Project. The Contractor shall require similar written waivers in favor of the Owner and any of its agents and employees from its subcontractors, and sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

## § 11.4 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 mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

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

## **ARTICLE 12 UNCOVERING AND CORRECTION OF WORK**

### **§ 12.1 Uncovering of Work**

**§ 12.1.1** If a portion of the Work is covered contrary to the Architect's or Owner'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, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a Separate Contractor in which event the Owner shall be responsible for payment of such costs.

### **§ 12.2 Correction of Work**

#### **§ 12.2.1 Before Substantial Completion**

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

#### **§ 12.2.2 After Substantial Completion**

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



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

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

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

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

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

### § 12.3 Acceptance of Nonconforming Work

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

## ARTICLE 13 MISCELLANEOUS PROVISIONS

### § 13.1 Governing Law

The Contract shall be governed by the law of the State of Michigan.

### § 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 prohibit the Owner from delegating their cost to the Contractor.

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

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

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

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

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

### **§ 13.5 Interest**

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

### **§ 13.6 Nondiscrimination**

Contractor, in performing the Work hereunder, shall ascertain and comply with all applicable Federal, State and local laws, regulations, ordinances, and all applicable trade and industry codes, regulations or standards. Whenever applicable, the following provisions will be incorporated by reference in the Contract: (a) EO 11246 and 41 CFR Part 60-1.4, relating to Equal Employment Opportunity; (b) EO 11246, relating to Affirmative Action Compliance; EO 13665 amending section 202 of EO 11246; (c) ASPER 12-806, DPC No. 67, relating to Segregated Facilities Certification; (d) EO 11701 and 41 CFR Part 50-250, 41 CFR Part 60-250, relating to Disabled Veterans and Veterans of the Vietnam Era; (e) 41 CFR 60-300.5(a) relating to the employment and advancement of qualified protected veterans; (f) the Rehabilitation Act of 1973 and 41 CFR Part 60-741.5(a), relating to employment and advancement of qualified individuals with disabilities; (g) ASPR Sec. 70-104.14(a), relating to Utilization of Small Business Concerns; (h) ASPR Sec. 1-805 and ASPR Sec. 1-1, 805-3(a), relating to Utilization of Labor Surplus Area Concerns; (i) ASPR 7-402.13 including ASPR 7-104.3 and FPR 1-7.202-14 including FPR 1-6.104-5, relating to Buy American Act; (j) 453 PA 1976 S 209, 605, and 704 of the State of Michigan relating to the Non-discrimination Clause; and (k) 278 PA 1980 of the State of Michigan prohibiting entering into contracts with certain employees who engage in unfair Labor practices.

### **§ 13.7 Michigan Right-to-Know Law**

- .1 All Contractors must conform to the provisions of the Michigan Right-To-Know Law, 1986 PA 80, which requires employers to: (1) Develop a communication program designed to safeguard the handling of hazardous chemicals through labeling of chemical containers, and development and availability of Safety Data Sheets (SDS); (2) Provide training for employees who work with these chemicals; and (3) Develop a written hazard communication program.
- .2 The law provides for specific employee rights. These include: (1) The right to be notified by employer or contractor of new or revised Safety Data Sheets; (2) The right to be notified (by employer or contractor) of new or revised Safety Data Sheets no later than five (5) working days after receipt, and (3) The right to request copies of Safety Data Sheets from their employer.

**§ 13.8 START-UP, COMMISSIONING AND TRAINING:** The Contractor, in the presence of the Owner and the Owner's designated maintenance personnel, shall observe the Subcontractors' and separate contractors' checkout of utilities, operational systems and equipment for readiness, assist in their initial start-up and testing, and assure that all systems and equipment operate properly. The Contractor shall prepare and provide to the Owner a written report setting forth in reasonable detail the results of the start up and testing of such equipment and systems. The Contractor shall take such steps as may be necessary to assure that all corrections, repairs and/or replacements are made so that all systems and equipment operate and perform their functions as intended. Prior to start-up and testing of equipment, and as part of the startup procedures and processes, the Contractor will conduct a detailed commissioning of all equipment and systems, including without limitation electrical and mechanical equipment, systems, apparatus, components, etc., as a unit or separately as deemed appropriate by the Owner, including but not limited to, HVAC, RAU, VFD, RTU, electronic building management system(s), pneumatic or electronic temperature controls, hoisting equipment, pumps, boiler, chillers, fire alarms, security systems, automated entries, operating room filtering and humidification systems, isolation transformers, medical gas distribution systems, and nurse call, sound, and public address systems. All equipment, apparatus, and systems are to be commissioned whether or not specifically identified in the foregoing list of descriptions. The commissioning will be conducted to ensure that systems perform as required in the Contract Documents, contain all items required, and properly operate and perform their intended functions as integrated into the completed systems and the completed Project. The Contractor shall prepare or obtain from the responsible Subcontractors and separate contractors commissioning records and reports, and such commissioning records shall be prepared as part of the start up and testing process and procedures and supplied to the Owner for review prior to scheduling equipment and systems start-up and testing. The Contractor shall implement appropriate training methods and measures to assure that, during the commissioning and start-up process and procedures, the Owner's maintenance and operations personnel designated by the Owner are completely trained in the proper operation and maintenance of all of the equipment, apparatus, and systems that are part of the Project.

**§ 13.9 Owner's Administrative Policies:** Contractor and its employees shall follow all of Owner's administrative policies and guidelines while on the Owner's property. A list of Owner's administrative policies can be found at: <https://www.cmich.edu/offices-departments/general-counsel/policies-procedures-guidelines-index>.

**§ 13.10 Freedom of Information Act:** Owner is a constitutionally created body of the State of Michigan. Owner is required to comply with the Freedom of Information Act (FOIA). In the event that Owner receives a FOIA request requiring disclosure of this agreement or any accompanying documents Owner considers public records, Contractor understands that this is a mandatory disclosure compelled by law. Further, the disclosure of this agreement shall not be considered a break of the agreement by Owner.

## **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 60 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

- .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; or
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents.

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

**§ 14.1.3** If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work

executed as well as reasonable overhead and profit therefore, and reasonable costs incurred by reason of such termination.

**§ 14.1.4** If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written 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;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority;
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents;
- .5 files a petition under any federal or state law concerning bankruptcy, reorganization, insolvency, or relief from creditors, or is such a petition is filed against Contractor without its consent and is not dismissed within sixty (60) days;
- .6 fails to comply with a Change Directive;
- .7 fails to cooperate or otherwise interferes with the Owner's exercise of any right or remedy provided in the Contract Documents.
- .8 becomes insolvent, or if the Contractor consents to the appointment of a receiver, trustee, liquidator, custodian or the like of the Contractor or of all or any substantial portion of its assets, or if a receiver, trustee, liquidator, custodian or the like is appointed with respect to the Contractor or takes possession of all or any substantial portion of its assets and such appointment or possession is not terminated within sixty (60) days of the appointment, or if the Contractor makes an assignment for the benefit of creditors;
- .9 falls behind schedule and remains behind schedule seven (7) days after written notice from the Owner that it is behind schedule in violation of Section 8.3.7 and an acceptable recovery plan is not adopted by the Owner and Contractor; or
- .10 if the Contractor violates the Owner's or its own safety procedures, or if an Subcontractor violates such safety procedure and Contractor fails to address the issue in accordance with industry safety standards.

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

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

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

**§ 14.2.4** If the Owner terminates this Contract for cause as permitted herein, Owner shall not have any obligation to make any payment to Contractor under this Contract or otherwise, except for the Work already executed in accordance with the Contract Documents. If the costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived exceed the unpaid balance of the Contract Sum, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

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

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

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

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

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

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

**§ 14.4.2** Upon written 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 receive payment for Work executed, and reasonable direct costs incurred by reason of such termination but not for overhead or profit for Work not performed.

## **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 Intentionally Deleted.**

#### **§ 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, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

### § 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, written notice as provided herein shall be given. The Contractor's Claim shall comply with the requirements set forth in Section 8.3.1 and include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

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

### § 15.1.7 No Damages for Delay

Contract Sum and Limitation of Damages. The Owner agrees to pay and the Contractor agrees to accept the amount set forth in the Contract Sum as full compensation for all labor, supervision, equipment, home office and field overhead, materials, administrative and incidental expense required in executing all of the Work contemplated in this Contract and set forth in the Contract Documents, including all loss or damage arising out of the Work, as impacted by the elements or from any obstruction, delay or difficulties which may be encountered. Any other provisions of the Contract Document to the contrary notwithstanding. No claims for extra compensation or adjustments in the Contract Sum will be made by or allowed to the Contractor on account of delay (except for delays caused solely by the Owner or force majeure), costs incurred as a result of variations within the as-planned schedule, or the failure of the Contractor or their subcontractors to complete any of the Work as scheduled. Contractor agrees that its sole remedy for delay (except for delays caused solely by the Owner or force majeure) shall be an extension of the Contract Time, if justified under the Contract Documents.

### § 15.2 Initial Decision

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

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

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

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

receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

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

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

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

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

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

### **§ 15.3 Mediation**

**§ 15.3.1** Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4 and 9.10.5 shall be subject to mediation as provided herein.

**§ 15.3.2** Unless the parties mutually agree otherwise, mediation shall be in accordance with Michigan Court Rules 2.411 currently in effect. Request for mediation shall be filed in writing with the other party to the Contract. Owner and Contractor agree that any mediation shall be completed as soon as practicable considering the issue or issues in mediation, but in any event not later than 180 days after the request for mediation is filed. Owner and Contractor shall select a mediator who agrees to render a decision within the foregoing time requirements. After the completion of mediation or the passage of said 180 days, whichever occurs earlier, mediation as a condition precedent to litigation shall be considered to be satisfied and either party may institute litigation, notwithstanding laches, defense shall be tolled for the period of time between the filing of the request for mediation and the completion of mediation or the passage of said 180 days, whichever occurs earlier.

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

### **§ 15.4 Intentionally Deleted**

### **§ 15.5 Venue**

Litigation of any claim or dispute arising under or relating to the Contract shall only be brought in either the Michigan Court of Claims, or the United States District Court for the Eastern District of Michigan, as may be permitted, and the parties consent to such jurisdiction and venue. However, this paragraph shall not be construed as a waiver of any immunity granted under state or federal law, including, but not limited to, governmental or sovereign immunity.

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## Title 29 - Labor

### Subtitle A - Office of the Secretary of Labor

#### Part 5 - Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction (Also Labor Standards Provisions Applicable to Nonconstruction Contracts Subject to the Contract Work Hours and Safety Standards Act)

#### Subpart A - Davis-Bacon and Related Acts Provisions and Procedures

Source: 48 FR 19540, Apr. 29, 1983, unless otherwise noted.

Authority: 5 U.S.C. 301; R.S. 161, 64 Stat. 1267; Reorganization Plan No. 14 of 1950, 5 U.S.C. appendix; 40 U.S.C. 3141 *et seq.*; 40 U.S.C. 3145; 40 U.S.C. 3148; 40 U.S.C. 3701 *et seq.*; and the laws listed in 5.1(a) of this part; Secretary's Order No. 01-2014 (Dec. 19, 2014), 79 FR 77527 (Dec. 24, 2014); 28 U.S.C. 2461 note (Federal Civil Penalties Inflation Adjustment Act of 1990); Pub. L. 114-74 at sec. 701, 129 Stat 584.

Source: 48 FR 19541, Apr. 29, 1983, unless otherwise noted.

**Editorial Note:** Nomenclature changes to subpart A of part 5 appear at 61 FR 19984, May 3, 1996.

### § 5.5 Contract provisions and related matters.

- (a) The Agency head shall cause or require the contracting officer to insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a public building or public work, or building or work financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1, the following clauses (or any modifications thereof to meet the particular needs of the agency, *Provided*, That such modifications are first approved by the Department of Labor):

(1) *Minimum wages.*

- (i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs

which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided*, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)

- (A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:
  - (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
  - (2) The classification is utilized in the area by the construction industry; and
  - (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
- (B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
- (C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
- (D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

- (iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor

shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided*, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) *Withholding.* The Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the Owner may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) *Payrolls and basic records.*

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)

(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the EDA if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the

payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the EDA. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the Owner if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency), the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

- (B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
    - (1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;
    - (2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;
    - (3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
  - (C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.
  - (D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.
- (iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the (write the name of the agency) or the Department of Labor, and shall permit such

representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) *Apprentices and trainees-*

(i) *Apprentices.* Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination.

Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) *Trainees.* Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress,

expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

- (iii) *Equal employment opportunity.* The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.
- (5) *Compliance with Copeland Act requirements.* The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.
- (6) *Subcontracts.* The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EDA may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.
- (7) *Contract termination: debarment.* A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.
- (8) *Compliance with Davis-Bacon and Related Act requirements.* All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.
- (9) *Disputes concerning labor standards.* Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.
- (10) *Certification of eligibility.*
  - (i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(b) *Contract Work Hours and Safety Standards Act.* The Agency Head shall cause or require the contracting officer to insert the following clauses set forth in paragraphs (b)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by § 5.5(a) or § 4.6 of part 4 of this title. As used in this paragraph, the terms *laborers* and *mechanics* include watchmen and guards.

(1) *Overtime requirements.* No contractor or subcontractor contracting for any part of the work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) *Violation; liability for unpaid wages; liquidated damages.* In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of \$31 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) *Withholding for unpaid wages and liquidated damages.* The Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) *Subcontracts.* The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(c) In addition to the clauses contained in paragraph (b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in § 5.1, the Agency Head shall cause or require the contracting officer to insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including

guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Agency Head shall cause or require the contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the Owner and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

*(The information collection, recordkeeping, and reporting requirements contained in the following paragraphs of this section were approved by the Office of Management and Budget:*

Paragraph	OMB Control No.
(a)(1)(ii)(B)	1235-0023
(a)(1)(ii)(C)	1235-0023
(a)(1)(iv)	1235-0023
(a)(3)(i)	1235-0023
(a)(3)(ii)(A)	1235-0023
	1235-0008
(c)	1235-0023

*[48 FR 19540, Apr. 29, 1983, as amended at 51 FR 12265, Apr. 9, 1986; 55 FR 50150, Dec. 4, 1990; 57 FR 28776, June 26, 1992; 58*

*FR 58955, Nov. 5, 1993; 61 FR 40716, Aug. 5, 1996; 65 FR 69693, Nov. 20, 2000; 73 FR 77511, Dec. 19, 2008; 81 FR 43450, July 1,*

*2016; 82 FR 2225, 2226, Jan. 9, 2017; 83 FR 12, Jan 2, 2018; 84 FR 218, Jan. 23, 2019; 87 FR 2334, Jan. 14, 2022; 88 FR 2215,*

*Jan. 13, 2023]*



"General Decision Number: MI2023012702/03/2023 Superseded General

Decision Number: MI20220127

State: Michigan

Construction Type:

Building

County: Isabella County in Michigan.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR5.1(a)(2)-(60).

If the contract is entered  into on or after January 30,  2022, or the contract is  renewed or extended (e.g.,an  option is exercised) on or  after January 30, 2022:       	.   Executive Order 14026   generally applies to the   contract.  .   The contractor must pay   all covered workers at   least \$16.20 per hour (or   the applicable wage rate   listed on this wage   determination, if it is   higher) for all hours   spent performing on the   contract in 2023. 
If the contract was awarded on .  or between January 1,2015 and  January 29, 2022,and the  contract is notrenewed or  extended on orafter January  30, 2022:       	ExecutiveOrder 13658   generally applies to the     contract.  . The contractor must payall    covered workers at least   \$12.15 per hour (or the   applicable wage ratelisted    on this wagedetermination,    if it is higher) for all   hours spentperforming on   that contract in 2023. 

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the

Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date 0
1	01/06/2023
	02/03/2023

ASBE0047-005 07/01/2022

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	\$34.62	18.58
-----	BOIL0169-002	01/01/2021

	Rates	Fringes
BOILERMAKER.....	\$35.95	34.52
-----	BRMI0009-017	08/01/2020

	Rates	Fringes
BRICKLAYER.....	\$30.00	21.24
TILESETTER.....	\$29.82	15.35
-----	CARP0706-021	06/01/2020

	Rates	Fringes
CARPENTER (AcousticalCeiling Installation, Drywall Hanging, and Metal Stud Installation).....	\$27.61	21.84
-----	CARP1102-003	06/01/2020

	Rates	Fringes
MILLWRIGHT.....	\$35.50	34.10
-----	ELEC0275-006	06/01/2022

Townships of Bloomfield, Coldwater, Deerfield, Fremont, Gilmore, Nottawa, Rolland, & Sherman

	Rates	Fringes
ELECTRICIAN (Excludes Low Voltage Wiring).....	\$ 34.41	9.27+28%
-----	ELEC0557-011	06/01/2020

Townships of Coe & Lincoln

	Rates	Fringes
ELECTRICIAN (Excludes Low Voltage Wiring).....	\$ 34.25	23.13
-----	ELEC0692-025	06/01/2022

Townships of Chippewa, Denver, Isabella, Union, Vernon, & Wise

	Rates	Fringes
ELECTRICIAN (Excludes Low Voltage Wiring).....	\$35.31	38.03%+9.25
----- ENGI0324-023 06/01/2022		

	Rates	Fringes
OPERATOR: Power Equipment		
GROUP 1.....	\$ 44.13	24.85
GROUP 2.....	\$ 40.83	24.85
GROUP 3.....	\$ 38.18	24.85
GROUP 4.....	\$ 36.47	24.85
GROUP 5.....	\$ 30.61	24.85
GROUP 6.....	\$ 26.38	24.85

Crane operator with main boom and jib 300' or longer: \$1.50 per hour above the group 1 rate.

Crane operator with main boom and jib 400' or longer: \$3.00 per hour above the group 1 rate.

PAID HOLIDAYS: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day.

- POWER EQUIPMENT OPERATOR CLASSIFICATIONS
- GROUP 1: Crane operator with main boom and jib 400', 300', or 220' or longer.
  - GROUP 2: Crane operator with main boom and jib 140' or longer; tower crane; gantry crane and whirleyderrick
  - GROUP 3: Crane; Loader; Paver; Scraper; Stiff Leg Derrick
  - GROUP 4: Bobcat/Skid Loader; Fork Truck (over 20' lift)
  - GROUP 5: Fork Truck (20' lift and under for masonry work)
  - GROUP 6: Oiler

-----  
\* IRON0025-009 04/01/2022

	Rates	Fringes
IRONWORKER, STRUCTURAL (Metal Building Erection Only).....	\$24.59	25.43
-----		

\* IRON0025-010 06/01/2022

	Rates	Fringes
IRONWORKER, REINFORCING.....	\$31.43	34.77
IRONWORKER, STRUCTURAL.....	\$34.50	38.44
----- LABO1098-030 07/01/2021		

	Rates	Fringes
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LABORER

Mason Tender - Cement/Concrete and Pipelayer.....	\$22.67	12.90
Sandblaster.....	\$23.72	12.90

----- PAIN1803-001 06/01/2022

	Rates	Fringes
PAINTER: Brush, Roller and Spray.....	\$26.27	20.17
PAINTER: Drywall Finishing/Taping.....	\$26.27	20.17

----- PLAS0016-039 04/01/2014

	Rates	Fringes
CEMENT MASON/CONCRETEFINISHER...	\$ 25.47	12.38
PLASTERER.....	\$26.32	12.88

----- PLUM0085-007 05/04/2021

	Rates	Fringes
PIPEFITTER (Excludes HVAC Pipe and SystemInstallation)....	\$ 40.00	21.14
PLUMBER (Excluding HVAC Pipe and SystemInstallation).....	\$ 38.25	21.07
PLUMBER (HVAC Pipe Installation Only).....	\$ 38.25	21.07

\* SFMI0669-003 04/02/2022

	Rates	Fringes
SPRINKLER FITTER (Fire Sprinklers).....	\$38.69	25.22

----- SHEE0007-021 05/01/2018

	Rates	Fringes
SHEET METAL WORKER(Excluding HVAC Duct & System Installation).....	\$26.83	23.78
SHEET METAL WORKER (HVAC Duct & SystemInstallation).....	\$ 26.83	23.78

\* SUMI2011-052 02/14/2011

	Rates	Fringes
CARPENTER (Form WorkOnly).....	\$ 23.08	1.22

CARPENTER, Excludes Acoustical  
 Ceiling Installation, Drywall Hanging,  
 Form Work, Metal Stud Installation,  
 and Soft  
 Floor Laying-Carpet.....\$

		21.67	3.56
FLOOR LAYER:	Carpet.....\$	19.59	7.57

GLAZIER.....	\$ 16.95	4.74
LABORER: Common or General.....	\$ 16.72	1.22
LABORER: Landscape & Irrigation.....	\$ 12.84 **	0.00
LABORER: Mason Tender -Brick....	\$ 15.36 **	3.10
OPERATOR: Backhoe/Excavator.....	\$ 24.24	3.06
OPERATOR: Bulldozer.....	\$ 22.34	1.22
OPERATOR: Grader/Blade.....	\$ 24.04	6.03
OPERATOR: Roller.....	\$ 28.02	7.07
OPERATOR: Tractor.....	\$ 19.60	7.31
ROOFER.....	\$ 15.71 **	8.02
TRUCK DRIVER, Includes Dump and Tandem Truck.....	\$ 15.65 **	3.12
TRUCK DRIVER: Flatbed Truck.....	\$ 16.80	3.97

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

=====

\*\* Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$16.20) or 13658 (\$12.15). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in

the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.



----- WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wagedetermination
- \* a survey underlying a wagedetermination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate)ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of ConstructionWage Determinations. Write to:

Branch of Construction WageDeterminations Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue,N.W. Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Writeto:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue,N.W. Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to theissue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the WageAppeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue,N.W. Washington, DC 20210

4.) All decisions by the Administrative Review Board arefinal.

===== END OF GENERAL DECISION"

**END OF SECTION 00 9000**

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## CERTIFICATION REGARDING LOBBYING LOWER TIER COVERED TRANSACTIONS

Applicants should review the instructions for certification included in the regulations before completing this form. Signature on this form provides for compliance with certification requirements under 15 CFR Part 28, "New Restrictions on Lobbying."

### LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 15 CFR Part 28, for persons entering into a grant, cooperative agreement or contract over \$100,000 or a loan or loan guarantee over \$150,000 as defined at 15 CFR Part 28, Sections 28.105 and 28.110, the applicant certifies that to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure occurring on or before October 23, 1996, and of not less than \$11,000 and not more than \$110,000 for each such failure occurring after October 23, 1996.

### Statement for Loan Guarantees and Loan Insurance

The undersigned states, to the best of his or her knowledge and belief, that:

In any funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this commitment providing for the United States to insure or guarantee a loan, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

Submission of this statement is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required statement shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure occurring on or before October 23, 1996, and of not less than \$11,000 and not more than \$110,000 for each such failure occurring after October 23, 1996.

**As the duly authorized representative of the applicant, I hereby certify that the applicant will comply with the above applicable certification.**

NAME OF APPLICANT

AWARD NUMBER AND/OR PROJECT NAME

06-01-06375

PRINTED NAME AND TITLE OF AUTHORIZED REPRESENTATIVE

SIGNATURE

DATE

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**NOTICE OF REQUIREMENTS FOR AFFIRMATIVE ACTION  
TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY  
(EXECUTIVE ORDER 11246 AND 41 CFR PART 60-4)**

The following Notice shall be included in, and shall be a part of all solicitations for offers and bids on all Federal and federally assisted construction contracts or subcontracts in excess of \$10,000.

The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

<b>Timetables</b>	<b>Goals for minority participation for each trade</b>	<b>Goals for female participation for each trade</b>
	<b>%</b>	<b>6.9%</b>

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and non federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is:

State of \_\_\_\_\_

County of \_\_\_\_\_

City of \_\_\_\_\_

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## SECTION 01 1000 - SUMMARY

### PART 1 GENERAL

#### 1.1 PROJECT

- A. Project Name: CMURC Rural Rescue Impact Plan – Isabella Transformation (RRIP-IT)
  - 1. Project Manager: Phil Tanner
- B. The University will designate a person, referred to in the contract documents as Project Manager, who will be authorized to perform the following functions on behalf of the University;
  - 1. Interpret the contract, including technical interpretations of the drawings and specifications, if necessary with the assistance of the architect or engineer, upon inquiry from the Contractor;
  - 2. Inspect work with regard to its quality and conformity with the plans and specifications and tests the work in each part thereof;
  - 3. Reject any defective or non-conforming part of the work;
  - 4. Request and accept proposals for changes in the work as herein provided;
  - 5. Evaluate the progress of the work;
  - 6. Receive and authorize Contractors applications for payments;
  - 7. Accept the work or any part thereof; and
  - 8. Otherwise act of the University in the administration of the contract.
- C. Architect's Name: Neumann/Smith Architecture
- D. The project includes but is not limited to:
  - 1. Construction of interior renovations to support multi-tenant spaces within the CMURC business incubator facility in Mount Pleasant, located at 2625 Denison Drive, Mount Pleasant, MI 48858. This approximate 11,500 square foot renovation will provide consistent architecture and interior design compared to the recently renovated CMURC spaces in Midland (801 Joe Mann Blvd., Suite P, Midland, MI 48642) and Saginaw (203 S. Washington Ste 260, Saginaw, MI 48602).
  - 2. This 11,489 square foot renovation will include:
    - 1. Demolition of existing office space and toilet rooms
    - 2. Reconfiguration of office space throughout to meet the users' current needs and future growth
    - 3. Creation of a public café area
    - 4. Installation of modular walls, doors, and finishes, provide flexibility for future incubator tenants
    - 5. Relocation of utilities including HVAC, plumbing, electrical, lighting, fire alarm, fire suppression and IT infrastructure

#### 1.2 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Section 00 5000 – Form of Agreement.

#### 1.3 OWNER OCCUPANCY

- A. Owner intends to continue to occupy adjacent portions of the existing building site during the entire construction period.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy of adjacent structures.
- D. All Work must be conducted so as to cause absolute minimum of interference with and inconvenience to Owner's continuing operations.
- E. All construction operations must be conducted as required to ensure complete safety to all persons (Owner's personnel, Contractor's personnel and others) who may be on site or adjacent to work.
- F. Entrances to and exits from existing buildings must be protected, kept free of restrictions or obstructions and maintained in full use at all times.

- G. All use by Contractor, subcontractors, suppliers, delivery, etc. of Owner's property (buildings and site) must be restricted to those areas designated by owner for such use. Contractor must obtain permission from Owner before beginning any use of property.
- H. Provide adequate safeguards for control of dust and moisture during construction. Close coordination with Owner for these environmental controls is mandatory.

#### **1.4 CONTRACTOR USE OF SITE AND PREMISES**

- A. Construction Operations: Limited to areas noted on drawings.
- B. Access to site will be discussed at Pre-Bid and Preconstruction Meetings.
- C. Construction Signs: Provide signs adequate to direct suppliers, visitors, etc. as specified on the civil drawings.
  - 1. Do not install, or allow to be installed, signs other than specified sign(s) which Owner has approved for installation on site.
  - 2. Only one contractor sign will be permitted on the site. It is to be no more than 32 square feet in area. The university shall approve graphic content. Graphic content shall include an illustration of the construction project, title of the project, and name of the construction contractor, name of the architect and principal consultants, funding source. No other project, design firm, or subcontractor signs will be permitted. Location of the sign shall be determined by the design architect and is subject to approval by the University. No other signs advertising company names will be permitted.
  - 3. Contractor shall supply, erect and maintain in good condition a project sign according to the EDA specifications. Refer to documents for details.
  - 4. Lawn and Site Protection: To extent possible, do not use lawn areas during construction project. When lawns are used, immediate repair is required. Delay of repair until end of project will not be permitted. After use, lawn and ruts are to be filled in with quality top-soil and re-seeded, to match surrounding conditions. Associated costs shall be borne by Contractor.
- D. Provide access to and from site as required by law and by Owner:
- E. Time Restrictions:
  - 1. Limit conduct to especially noisy work to hours of 7:00 am to 7:00 pm.
- F. Utility Outages and Shutdown:
  - 1. Limit disruption of utility services to hours agreed upon by the Owner.
  - 2. Prevent accidental disruption of utility services to other facilities.
  - 3. Perform utility shutdowns required for electrical work only during scheduled campus shutdown dates in May and August.
  - 4. Provide Owner with a written plan for all utility shutdowns with work assignments and schedule shutdown minimum of two (2) weeks prior to the planned shutdown.

#### **1.5 SECTION NUMBER FORMAT**

- A. Section Numbers: CSI Master Format 04 System. Example:
  - 1. Section 01 1000 – Summary

#### **1.7 CONTRACT DOCUMENTS**

- A. Each bidder shall examine the bidding documents carefully and, not later than seven (7) days prior to the date for receipt of bids, shall make written request to Owner and Architect for interpretation or correction of any ambiguity, inconsistency or error therein discovered. Only written interpretation or correction by Addendum shall be binding.
- B. Failure to review the complete set of documents and to identify items reasonably interpreted to be in the scope of work shall not relieve the Contractor of its responsibility to perform the Work.
- C. Any incidental item of material, labor or detail, required for proper execution and completion of the Work, omitted from the Contract Documents, but required by governing codes, local regulations, trade practices, operational functions, and quality workmanship, shall be provided as part of the contract Work at no additional cost, even though not specifically detailed or noted.



- D. Contractors are directed to use indicated dimensions for determining material quantities and for other reasons. No additional monies will be allowed due to Contractors using “scaling instruments” to determine material quantities or for other reasons.

**1.8 REGULATORY REQUIREMENTS – PERMITS, FEES, NOTICES AND LICENSE**

- A. The following regulations are applicable to this project:
1. 2015 Michigan Rehabilitation Code – For Existing Buildings – Level 2 Alteration
  2. 2015 Michigan Mechanical Code
  3. 2018 Michigan Plumbing Code
  4. 2010 ADA Standards for Accessible Design
  5. Barrier Free Design Law – State of Michigan
  6. NFPA – 101 Life Safety Code, 2012 Edition.
  7. 2017 Michigan Electrical Code Rules
  8. Regulation of Air Pollution Control Commission State of Michigan, and the Federal Clean Air Act (42 U.S.C. 1857C – 8 (1)).
  9. State of Michigan Occupational Safety Standards Act.
  10. Soil Erosion and Sedimentation Public Act 347 of 1972 as amended.
  11. Environmental Impact Statement Executive Order 1974-4
  12. State of Michigan Safe Drinking Water Act Public Act 339 of 1974
  13. 2015 State of Michigan Energy Code.
  14. State of Michigan Right-To-Know Law
  15. U.S. Department of Commerce, Economic Development Administration
    - a. Standard Terms and Conditions for Construction Projects
    - b. Title II of the Public Works and Economic Development Act of 1965, dated March 22, 2021
  16. U.S. Department of Commerce Economic Development Administration
    - a. EDA Contracting Provisions for Construction Projects, Expiration Date: January 31, 2025
  17. U.S. Department of Commerce Economic Development Administration
    - a. Summary of EDA Construction Standards, dated July 2018
  18. The Davis-Bacon Act, as amended (40 U.S.C. 3141-3144, 3146, 3147; 42 U.S.C. 3212)
  19. The Contract Work Hours and Safety Standards Act, as amended (40 U.S.C. 3701-3708)
  20. The National Historic Preservation Act of 1966, as amended (54 U.S.C. 300101 et seq.) and the Advisory Council on Historic Preservation Guidelines (36 CFR part 800)
  21. Preservation of Historical and Archeological Data (54 U.S.C. 312502)
  22. The Architectural Barriers Act of 1968, as amended (42 U.S.C. 4151 et seq.)
  23. The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. 4601 et seq.)
  24. The Energy Conservation and Production Act (42 U.S.C. 6834 et seq.)
  25. Executive Order 13717, “Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction”
- B. Code Listing: any reference to standards of any society, institute, association, or governmental agency which is part of building code which is in effect for this project; this project shall comply with edition date published in referenced edition of building code.
1. Edition in use and accepted by municipality (or agency) where project is located.
- C. Non-Code Listings: Any reference to standards of any society, institute, association, or governmental agency, not part of applicable building code for this project, shall be in effect at time of opening bids unless otherwise stated in this specification.
- D. Submit copies of all permits, licenses, and similar permissions obtain and receipts for fee paid to the Owner directly.
- E. Utility Tie-Ins: Shall be arranged with local utility company and other involved parties for minimum interruption of service.
1. Shutdown of existing systems shall be limited to minimum time required and scheduled with other involved parties. Follow CMU Utility Shutdown Procedure.

2. Inspections of installed work shall be performed by the governing authority as arranged for by the Subcontractor. Work shall not be covered until approved.

#### **1.9 HAZARDOUS MATERIALS ADVISORY**

- A. For all hazardous material related work, refer to AIA Contract Document A201-2017, General Conditions of the Contract for Construction.
- B. This building where project work is being completed was built after 1978.

#### **1.10 CMU WORK RESTRICTIONS**

- A. Site access shall be through designated routes or temporary roads as designated by the University's Project representative and as shown on the drawings.
- B. Utility Damage: Any contractor causing damage to underground utilities shall be responsible for all costs required to repair or replace the damaged utility.
- C. Walks and Drives: Contractor must keep existing walks and drives swept and free of sand and dirt during construction. Provide means to keep construction dirt off of streets.
- D. Pedestrian and vehicle access through, around or at the perimeter of the project must be maintained at all times. It is the responsibility of the design firm to determine needs, the method to accomplish the need, and to include the means in the design documents.
- E. Receiving of materials: CMU will not accept drop-shipped items for any contractor at its Central Receiving. Contractor could be charged for costs associated with misdirected deliveries.

### **PART 2 PRODUCTS**

#### **2.1 PRODUCT REQUIREMENTS**

- A. All materials and equipment provided shall be new and of quality equal to or higher than that required by Contractor Documents.
- B. In every case, requirements established by Contract Documents shall be considered a minimum of what will be accepted. Where strength of material(s) is a factor, all item furnished must have at least strength, carrying capacity and durability of item specified.
- C. Terms "or equal", "as approved", or "as approved equivalent", etc., as used in specifications or on drawings mean that the Architect shall have prerogative to approve or reject a material, procedure, etc. which may be proposed for substitution for that which is named and/or shown.
- D. Any reference to a specific brand and/or model is intended to establish quality, operating characteristics, size or type. Products of equal or better quality, operating characteristics, or type are acceptable.
  - a. Where one product and manufacturer is named as the "Design Standard" or "Basis of Design" and other manufacturers or manufacturers and products are specified by name, other manufacturer's equivalent product may be acceptable, subject to compliance with Contract requirements, including specifications of the product designated as the "Design Standard" or "Basis of Design", as determined by Architect.
- E. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
- F. Do not use products having any of the following characteristics:
  1. Made using or containing CFC's or HCFC's
- G. EXCLUSIONARY STATEMENT FOR BUILDING CONSTRUCTION/RENOVATION MATERIALS: Building materials/products used for renovations or replacement purposes are to be asbestos and lead-free. Asbestos and lead-free is to be defined as materials that contain 0% asbestos or lead. Contractors are to be prepared to submit data to verify the absence of asbestos and lead.
- H. PURCHASE AND WARRANTY OF CUSTOM AND/OR PROPRIETARY PRODUCTS:
  1. If the Contractor, either directly or through any of its subcontractors, material suppliers, and/or vendors (for purposed of the paragraph only "Provider"), incorporates into a University facility or sells the University other equipment comprising, in whole or in part, custom designed products

or components, including controls or computer software programs ("Products"), claimed by the Provider or Contractor to be proprietary, the Contractor shall:

2. Warrant the Products free from defects and perform, at no additional charge to the University, all repairs, including parts and labor necessary to render the Products operational up to that performance initially called for by specification, for the useful life of the Products or for the warranted period tendered, whichever is shorter; and
3. Maintain the Products, at whatever charge the parties may agree to before installation of the products, for the useful life of the Products, and in the absence of such prior agreement as to maintenance charges, at no cost; or
4. Deposit with the University the design documents, plans, technical specifications and source code, where necessary and applicable, even if claimed proprietary by the Provider, so the University, with or without the Provider or assistance from others, would be fully capable of repairing and properly maintaining the products.

## **2.2 SUBSTITUTION PROCEDURES**

### **A. Substitutions Before Award of Contract**

1. Bidder supplier may submit a proposed change to the Architect/Engineer for approval prior to seven (7) days before bid submission. Approval or rejection of each proposed substitution or other change shall be at the discretion of Architect/Engineer. If proposed change is approved, Architect will issue written statement certifying same.

### **B. Substitution Procedure**

1. No claim regarding unsuitability or unavailability of any material will be entertained unless such claims were made in writing stating proposed alternate materials and submitted with original bid. Furthermore, no substitution of materials other than those agreed upon prior to signing of contract will be permitted.
2. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
3. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.
4. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
5. A request for substitution constitutes a representation that the submitter:
  - a. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  - b. Will provide the same warranty for the substitution as for the specified product.
  - c. Will coordinate installation and make changes to other Work which may be required for the work to be completed with no additional cost to Owner.
  - d. Waives claims for additional costs or time extension which may subsequently become apparent.
  - e. Will reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
6. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision by authorities.
7. Data Required with Substitution Request: Provide at least the following data:
  - a. Identify product by specification section and paragraph number.
  - b. Manufacturer's name and address, trade name and model number of product (if applicable), and name of fabricator or supplier (if applicable).
  - c. Complete product data. Including, but not limited to, Material, Dimensions, Finishes, etc.
  - d. Description of changes that will be required in other work or products if the substitute product is approved.
8. Substitution Submittal Procedure:
  - b. Limit each request to one proposed substitution.

- c. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
- d. Submit Substitution Request Form CSI Form 13.1, a copy of which is attached at the end of this Section for your convenience, along with other supporting materials.
- e. The architect will notify Contractor in writing of decision to accept or reject request.
- 9. If proposed change is not approved, or if voluntary alternate is not accepted, material product or procedure named in specifications or shown on drawings MUST be provided.

### **2.3 SPARE PARTS AND MAINTENANCE PRODUCTS**

- A. Provide spare parts, maintenance, and extra products of types and in quantities specified in individual specification sections.
- B. Deliver to and place in location as directed; obtain receipt prior to final payment.

### **2.4 MATERIAL ATTIC STOCK**

- 1. As specified in individual specification sections.

## **PART 3 EXECUTION**

### **3.1 CAMPUS HEALTH AND SAFETY REQUIREMENTS**

- A. Sexual harassment of any of the Owner's personnel or construction personnel will not be allowed.
- B. Provide temporary supports as required to prevent movement and structural failure.
- C. Contractors will provide for their employees any required specialized safety equipment such as safety belts, safety goggles or shields, hearing protection, etc. it will be the responsibility of each employee to use this equipment as job conditions so merit.
- D. The Contractor shall not permit sale or use of alcoholic beverages, illegal drugs or controlled substance—all as defined by the laws of the State where project is located—on or about project site, nor shall Contractor allow any person under the influence of any of these substances to remain on premises.
- E. Jobsite shall be kept in a clean condition and orderly manner, clear of debris.
- F. No heavy duty mobile equipment shall be left unattended while running.
- G. Notify Owner of ALL accidents, no matter how minor. Contractors are to submit accident reports for ALL accidents using a written accident report form.
- H. The Contractor is responsible for:
  - 1. Taking all known and available measures and employing all techniques for the protection of the site, work in progress, and/or materials and equipment stored on site from damage, injury or loss from the elements, vandalism, theft or accelerated degradation or depreciation.
  - 2. Putting into place and continuously managing a meaningful and effective safety program, coordinated among all subcontractors with the Contractor's personnel, knowledgeable, trained, and experienced and actively employing safety education, risk recognition and avoidance, all OSHA and MIOSHA requirements, signage, tooling, personal protection devices and periodic inspections of all working conditions on site. The Contractor shall inspect, record and enforce for violations. The Contractor shall not rely upon or assume any specialized safety knowledge or experience on that part of the University.
  - 3. Complying with the Williams-Steiger Occupational Safety and Health Act of 1970 (OSHA), the Michigan "Occupational Safety and Health Act", Act 154 of the Public Acts of 1974 (MIOSHA), and all revisions contained therein. Compliance is a condition of this Contract for all construction, alteration and/or repair, include painting and decorating. No Contractor shall require or permit any laborer or mechanic employed in the performance of the Contract, to work in surroundings or under working conditions that are unsanitary, hazardous, or dangerous to their health.
  - 4. All contracts must also comply with Central Michigan University's current Confined Space Entry Program and Procedures as required by MIOSHA when entering or planning to enter any confined space. A copy can be obtained from the University's Project Manager for this Project.

5. All contractors must also comply with Central Michigan University's current Energy Control Program- Lockout/Tagout Procedures, especially Appendix Z, when they are maintaining or servicing any type of energized equipment. The entire procedure is available for your review in the University Engineering and Planning office. For information; the contact person referred to in the procedures is the project manager for the job in question. A copy of the overall program table of contents of Appendix Z can be obtained from the University's Project Manager for this Project.
6. Hot Work Program
  - a. All contractors must comply with Central Michigan University's current **HOT WORK PROGRAM**. The procedure is available for your review in the University Engineering and Planning Office (UEP Office). Form is attached at the end of this section. Completed Hot Work Permit (and associated check list) will be prominently displayed onsite and forwarded to the project manager, prior to hot work being accomplished.
7. Underground/Excavation Program
  - a. Anyone performing any type of digging on the Central Michigan University campus is responsible to: **call MISS DIG at 1-800-482-7171**.
  - b. You must call MISS DIG a minimum of **three working days** (excluding weekends) prior to the start of work.
  - c. Individuals contracting MISS DIG shall provide a clear description of the area to be marked and the name and phone number of a field contact should follow-up be required.
  - d. The contractor shall provide the CMU project manager with the MISS DIG ticket number when it is obtained and prior to digging.
  - e. Locating underground facilities is not an exact science; therefore, the actual location of underground facilities could vary slightly, either way from the position of the markings. Any utilities damaged will be repaired or replaced to CMU standards at full cost to the contractor/excavator.
  - f. If you dig **within six (6) feet** on either side of the utility, you are required to **hand dig to locate the buried utility**. This requirement is in addition to any requirements issued by MISS DIG regardless if the utility is owned by CMU or a public utility.
  - g. If existing markings locating underground utilities or lines are knocked down or faded, the contractor or CMU employee performing the work shall re-contact MISS DIG and request re-staking / re-marking.
  - h. MISS DIG will notify the CMU Facilities Management Service Center and the CMU Information Technology Department so that marking of CMU owned utilities will occur on the Central Michigan University Mount Pleasant Campus.
8. Utility Shutdown Procedures
  - a. See attached form for the University shut down procedure form. The utility shutdown plan is required during construction and maintenance of CMU Utilities. This plan is an effort to provide for a safe and reliable utility shutdown and restart. This plan shall be submitted a minimum of **two (2) weeks** prior to utility shutdown to ensure approvals and coordination.

### 3.2 UNDERGROUND UTILITY MAPPING PROCEDURE

- A. Ground penetrating radar or No-destructive excavation by means of hand digging / soft digging (i.e. use of a vacuum truck) to locate the exact locations of existing utility lines and services shall be included. The cost of these services shall be included in the contractors bid proposal.
- B. During the installation of underground utilities the CAD/GIS Manager shall be notified when the installation of Manholes, Valves, Clean-outs, Catch basins, utility line crossing, Etc. will be occurring. This can be completed by either a phone call or by completing the GPS Request form. A minimum of **two (2) hours** advanced notice is required.
- C. If during the construction a utility is found which did not appear on the plans immediately contact the CAD/GIS Manager to arrange for GPS location.
- D. Use the attached "GPS Request Form" for submitting request to the University CAD/GIS manager for GPS locating.

### **3.3 PROGRESS CLEANING**

- A. The Contractor shall at all times keep the premises free from accumulations of waste materials or rubbish caused by their employees or work and at the completion of the work Contractor shall remove all their waste, tools, equipment, staging and surplus materials from the structure and grounds and leave their work clean and ready for use.
- B. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- C. Remove debris and rubbish from the pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing this space.
- D. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.
- E. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.
- F. Keep the site and the work free of waste materials and debris.
  - 1. Keep hazardous and unsanitary materials in containers separate from other waste.
- G. Clean areas in which work is to be done to level of cleanliness necessary for proper execution of that work.
  - 1. Where dust would impair execution of work, broom and vacuum clean the entire interior area and keep clean.
- H. Keep installed work clean, and clean again when soiled by other operations.
  - 1. Provide periodic cleaning as required to prevent damage due to soiling.
  - 2. Remove liquid spills promptly.

### **3.4 DEMONSTRATION AND INSTRUCTION**

- A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.
- B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.
- E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

### **3.5 FINAL CLEANING**

- A. At closeout time, clean or re-clean entire work to normal level for "first class" maintenance/cleaning of building projects of a similar nature. Remove non-permanent protection and labels, polish glass, clean exposed finishes, touch up minor finish damage, clean or replace filters of mechanical systems, remove debris and broom clean non-occupied spaces, sanitize plumbing/food service facilities, clean light fixtures and replace burned-out/dimmed lamps, sweep and wash paved areas, police yards and grounds, and perform similar cleanup operations needed to produce a "clean" condition as judged by Architect/Engineer.
- B. Remove materials and equipment which are not part of the work and all debris from the site prior to substantial completion.
  - 1. Remove all surplus materials which are to remain property of the contractor; obtain the owner's instructions as to disposition of surplus material remaining on site and deliver, store, or dispose of as directed.
  - 2. Remove protective coverings.
  - 3. Remove temporary facilities.

- C. Dispose of debris:
  - 1. Do not burn or bury debris on the site.
  - 2. Do not dispose of volatile wastes in storm or sanitary drains.
  - 3. All material, equipment, rubbish and/or debris removed from the project site shall be extracted, transported, and disposed of in compliance with all local, State and federal laws and regulations.
  - 4. All payment applications for any funds due from the activities stated in the preceding subparagraph shall be accompanied by a sworn statement attesting that the extraction, transportation, and disposal of material, equipment, rubbish and/or debris from the project site was done in total compliance with all local, State, and federal laws and regulations.
- D. In spaces to be occupied, remove dirt, stains, and other foreign substances from all accessible surfaces and remove nonpermanent labels.
- E. In spaces not normally occupied, remove debris and surface dust and wipe equipment clean removing excess lubrication, paint, and other foreign substances.
- F. Remove paint and other coatings from permanent labels and from mechanical and electrical equipment nameplates.
- G. Leave the project clean and ready for occupancy.
- H. Execute final cleaning prior to final project assessment.
- I. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
- J. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains, and foreign substances, polish treatment and glossy surfaces, vacuum carpeted and soft surfaces.
- K. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- L. Clean filters of operating equipment.
- M. Clean debris from roofs, gutters, downspouts, and drainage systems.
- N. Clean site; sweep paved areas, rake clean landscaped surfaces.
- O. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.
- P. No final payment will be made until final clean-up is accomplished and inspection is made by Architect and Owner, accompanied by Contractor.

**END OF SECTION 01 1000**

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## **SECTION 01 2300 - ALTERNATES**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Administrative and procedural requirements governing Alternates.
  - 1. The Owner reserves the right to accept or decline alternates.
  - 2. The Owner reserves the right to accept, decline, and/or enter negotiations to modify Voluntary Alternates proposed by the Contractor and/or any subcontractor.

#### **1.03 DEFINITIONS**

- A. Definition: An alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to, or deducted from, the Base Bid amount if the Owner decides to accept a corresponding change in the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.

#### **1.04 PROCEDURES**

- A. Coordination: Modify or adjust affected adjacent Work as necessary to completely and fully integrate that Work into the Project.
  - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.
- B. Notification: Immediately following the award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate whether alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other Work of this Contract.
- D. Schedule: A "Schedule of Mandatory Alternates" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials necessary to achieve the Work described under each alternate.
  - 1. Only principle items of Work are highlighted in each mandatory alternate. Include as part of each alternate, miscellaneous devices, appurtenances, and similar items incidental to or required for a complete installation whether or not mentioned as part of the alternate.
  - 2. Voluntary alternates, as proposed by the Bidder, are as shown on the Proposal Form submitted by such Bidder.

### **PART 2 PRODUCTS (NOT APPLICABLE)**

### **PART 3 EXECUTION**

#### **3.01 SCHEDULE OF MANDATORY ALTERNATES**

Alternate No. 1: Open Office Acoustic Baffles

Delete AB-1 in Open Office Room 1064. Exposed ceiling, lighting and mechanical to remain as shown.

Alternate No. 2: Demountable Wall Partitions (Rooms 1020 through 1024)

Delete demountable wall partitions for Rooms 1020, 1021, 1022, 1023 and 1024. Ceiling conditions, including electrical and mechanical, to remain as shown. All related gypsum board assemblies and finish flooring materials to remain as shown.

Alternate No. 3: Demountable Wall Partitions (Rooms 1016 through 1019)

Delete demountable wall partitions for Rooms 1016, 1017, 1018 and 1019. Ceiling conditions, including electrical and mechanical, to remain as shown. All related gypsum board assemblies and finish flooring materials to remain as shown.

Alternate No. 4: Demountable Wall Partitions (Rooms 1025 through 1028)

Delete demountable wall partitions for Rooms 1025, 1026, 1027 and 1028. Ceiling conditions, including electrical and mechanical, to remain as shown. All related gypsum board assemblies and finish flooring materials to remain as shown.

Alternate No. 5: V.I.P Suite Millwork

Delete new millwork as shown in V.I.P Suite Room 1063. Existing Millwork to remain in lieu of new millwork.

Alternate No. 6: Work Cafe Millwork

Delete new millwork as indicated in Work Cafe Room 1055. Provide floor finish to match adjacent scheduled flooring in lieu of millwork. Provide all electrical rough-in for future appliances.

**END OF SECTION**

## **SECTION 01 3000 – ADMINISTRATIVE REQUIREMENTS**

### **PART 1 GENERAL**

#### **1.1 PROJECT COORDINATION**

- A. Cooperate with the Project Manager in allocation of mobilization areas of site; for field offices and sheds, for site and building access, traffic, and parking facilities.
- B. During construction, coordinate use of site and facilities through the Project Manager.
- C. Comply with Project Manager's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- D. Comply with instructions of the Project Manager for use of temporary utilities and construction facilities.
- E. Coordinate field engineering and layout work under instructions of the Project Manager.
- F. Make the following types of submittals to Architect and copy the Project Manager.
  - 1. Requests for interpretation.
  - 2. Requests for substitution.
  - 3. Shop drawings, product data, and samples.
  - 4. Test and inspection reports.
  - 5. Manufacturer's instruction and field reports.
  - 6. Applications for payment and change order requests.
  - 7. Progress schedules.
  - 8. Coordination drawings.
  - 9. Closeout submittals.
- G. The Contractor shall coordinate their activities with the activities of other contractors.
- H. Inform each party involved, in writing, of procedures required for coordination. Include requirements for giving notice, submitting reports and attending meetings.
  - 1. Inform the owner when coordination of their work is required.
- I. Coordinate scheduling, 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.
- J. Notify affected utility companies and comply with their requirements.
- K. Verify that utility requirements and characteristics of new 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.
- L. Coordinate space requirements, supports, and installation for mechanical and electrical work which are indicated diagrammatically on 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.
- M. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- N. Coordinate completion and clean-up of work of separate sections.
- O. 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.

### **PART 2 PRODUCTS – NOT USED**

### **PART 3 EXECUTION**

#### **3.1 PROGRESS MEETINGS**

- A. Schedule and administer meetings throughout progress of the work at weekly intervals unless otherwise approved by the Owner.
  - 1. Meeting Schedule: Timing, scheduling and location to be determined at preconstruction meeting.

- B. Make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.
- C. Attendance Required: Owner/ Architect:
  - 1. Representative from Contractor's main office.
  - 2. Project superintendent.
  - 3. Major subcontractors and suppliers that are currently active; or who will become active in the next two weeks. An acceptable alternate is Owner attendance at a weekly meeting with the Contractor and their subcontractors with an agenda similar to the one included below.
  - 4. Others who the General Contractor determines have an interest in the agenda.
- D. Those required to attend progress meetings, but fail to do so, will face the possibility of dismissal from their task, and others being brought in to carry out the work.
- E. At the first progress meeting, present an established complete construction schedule defining the critical path.
- F. Agenda: Prepare and distribute the agenda prior to meetings; cover the following topics when applicable:
  - 1. Review minutes of previous meetings.
  - 2. Review of work progress since last meeting.
  - 3. Review work planned during succeeding work period; a two week look ahead.
  - 4. At least twice a month, review the complete project schedule focusing on any changes that have impacted the critical path and plans to assure the substantial completion date is met.
  - 5. Review all field observations, problems, and decisions that are open or have been identified and addressed since the last meeting. Input to the observation log list shall include observations including but not limited to those made by the Contractor, Architect, Owner and consultants including but not limited to the inspection and testing agency. Reference Section 01-300, 3.7 and 01-4000, 3.1.
  - 6. Identification of problems which impede planned progress.
  - 7. Review submittal status including submittals that are due to the Architect in the upcoming two weeks, submittals being addressed by the Architect and when a response from the Architect is required, and submittals that have been addressed since the last meeting.
  - 8. Review of off-site fabrication and delivery schedules.
  - 9. Review of long lead items and expected delivery schedules.
  - 10. Review open RFIs and when a response is required; and a summary of those that have been addressed since the last meeting.
  - 11. Approved and pending change order status report.
  - 12. Cumulative total of Cost of the Work to date including compensation and reimbursable expenses, if any.
  - 13. Review plan review, permit(s), tests and inspection status and address of comments.
  - 14. Review sustainable design objective status.
  - 15. Other business relating to work.
  - 16. If a Commissioning Agent is a part of the organization of this project, add the following:
    - a. Overview of commissioning manual and updates.
    - b. Commissioning schedule and functional testing progress.
    - c. Construction issues regarding commissioning.
  - 17. Record minutes and distribute copies within five days after meeting to participants, with one copy to Architect, Owner, participants, and those affected by decisions made.

### **3.2 PRE CONSTRUCTION MEETING**

- A. A preconstruction meeting will be held at a time and place designated by the Owner, for the purpose of identifying responsibilities of the Owner's and the Architect's personnel and explanation of administrative procedures.
- B. Before the start of construction, a pre-construction meeting shall be held in the University Engineering and Planning Department Office with the successful bidder. It shall be the Contractor's

responsibility to arrange and lead said meeting as soon as notification of award has been made by the University. Once the work is started, it shall proceed to completion without delay.

- C. Attendance Required:
  - 1. Owner.
  - 2. Architect.
  - 3. Contractor.
  - 4. Each prime contractor and their superintendents.
  - 5. Major subcontractors, suppliers, and fabricators.
  - 6. Others interested in the work.
- D. Agenda:
  - 1. Execution of Owner-Contractor Agreement.
  - 2. Submission of executed bonds and insurance certificates.
  - 3. Distribution of Contract documents.
  - 4. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.
  - 5. Permits Required.
  - 6. Designation of personnel representing the parties to Contract, and subcontractor, and Architect.
  - 7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, change orders, and contract closeout procedures.
  - 8. Scheduling.
  - 9. Use of areas of the site.
  - 10. Delivery and storage.
  - 11. Safety.
  - 12. Security.
  - 13. CMU Emergency Management Central Alert System.
  - 14. Cleaning up.
  - 15. Subcontractor procedures relating to:
    - a. Submittals.
    - b. Change orders.
    - c. Applications for payment.
    - d. Record documents.
  - 16. Review open Action Items list.
- E. Site Mobilization
  - 1. Use of premises by Owner and Contractor.
  - 2. Owner's requirements
  - 3. Construction facilities and controls provided by Owner.
  - 4. Temporary utilities provided by Owner.
  - 5. Survey and building layout.
  - 6. Security and housekeeping procedures.
  - 7. Schedules.
  - 8. Application for payment procedures.
  - 9. Procedures for testing.
  - 10. Procedures for maintaining record documents.
  - 11. Requirements for start-up of equipment.
  - 12. Inspection and acceptance of equipment put into service during construction period.
- F. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

### **3.3 PRE-INSTALLATION MEETINGS**

- A. When required in individual specification sections, convene a pre-installation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect and Owner five days in advance of meeting date.

- D. Prepare agenda and preside at meeting:
  - 1. Review conditions of examination, preparation and installation procedures.
  - 2. Review coordination with related work.
- E. Record minutes and distribute copies within three days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

### **3.4 CONSTRUCTION PROGRESS SCHEDULE**

- A. Within three (3) days after date established in Notice to Proceed, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 5 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
  - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
  - 2. Include manpower loading for all major construction activities.
- D. Within 5 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

### **3.5 REQUESTS FOR INTERPRETATION (RFIs)**

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
  - 1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
  - 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. Date.
  - 3. Name of Contractor.
  - 4. Name of Architect.
  - 5. RFI number, numbered sequentially.
  - 6. Specification Section number and title and related paragraphs, as appropriate.
  - 7. Drawing number and detail references, as appropriate.
  - 8. Field dimensions and conditions, as appropriate.
  - 9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  - 10. Contractor's signature.
  - 11. Attachments: Include drawings. Descriptions, measurements, photos, product data, shop drawings, and other information necessary to fully describe items needing interpretation.
    - a. Supplementary drawings prepared by Contractor shall include dimensions. Thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
  - 1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven (7) working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
  - 1. The following RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.

- c. Requests for coordination information already indicated in the contract documents.
  - d. Requests for adjustments in the Contract time or the Contract Sum.
  - e. Requests for interpretation of Architect's actions on submittals.
  - f. Incomplete RFIs or RFIs with numerous errors.
- 2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
- 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 Division 01 Section "Contract Modification Procedures."
  - a. If Contractor believe the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. 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.
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. See attached sample of log. Architect to provide successful bidder with electronic copy of log for Contractor's upkeep.

### **3.6 CONTRACT MODIFICATION PROCEDURES**

- A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or Subcontractors of changes to the work.
- B. When requested in writing, the Contractor shall provide sufficient information for evaluation of proposed changes within 14 calendar days.
- C. Proposal Request (Bulletin): Architect may issue a document which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change and the period of time during which the requested price will be considered valid Contractor shall prepare and submit a fixed price quotation within 14 days.
  - 1. A bulletin or proposal request is issued after award of contract to inform Contractor of certain proposed modifications in the work. It is not an authorization to make any changes in the work. The applicable provision for the contract documents shall govern all work. Approved items will be followed by a Change Order, to adjust the appropriate contract amounts.
  - 2. The Contractor will fill in the dollar amount of the add or the deduct for each of the items listed. The Contractor shall complete an itemized cost breakdown for each of the items listed. The itemization shall include units of labor and material plus overhead and profit.
  - 3. Each trade contractor shall review the entire bulletin, including work of other trades, for revisions or clarifications regarding their own work. Any revision that causes a change to their contract but is not specifically mentioned in this bulletin should be brought to the attention of the Contractor in writing.
- D. Contractor may propose a change by submitting a request for change to Architect, describing the propose change its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors.
- E. Computation of Change in Contract Amount:
  - 1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
  - 2. For change requested by Contractor, the amount will be based on the Contractor's request for a change order as approved by Architect.
  - 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
  - 4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.
- F. Substantiation of Costs: Provide full information required for evaluation.

1. Contractors shall not use cost scheduled (such as MCA – Mechanical Contractors Association) in determining total cost for extras. The subcontractor's estimate shall be based on past experience of time and material to perform the work shall be used, if a time and material contract, the actual time it took to perform the work. A cost schedule may be used as a guide, however it shall not to be the sole source for preparing a cost for an extra.
2. Provide the following information for every change proposal request:
  - a. The amount of change in the contract sum, if any.
  - b. The amount of change in the contract time, if any, with explanation.
  - c. Cost breakdown, using schedule of values line items, separated into material and labor costs, additions and deletions, and with overhead and profit handled in the same manner as specified for the schedule of values.
  - d. The period of time within which the proposed changes in contract sum or time will be valid.
3. On request, provide following data:
  - a. Quantities of products, labor, and equipment.
  - b. Taxes, insurance and bonds.
  - c. Overhead and profit.
  - d. Justification for any change in Contract Time.
  - e. Credit for deletions from Contract, similarly documented.
4. Support each claim for additional costs with additional information:
  - a. Origin and date of claim.
  - b. Dates and times work was performed, and by whom.
  - c. Time records and wage rates paid.
  - d. Invoices and receipts for products, equipment, and subcontractors, similarly documented.
5. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract on AIA G701.
- H. After execution of Change Orders, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- I. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- J. Promptly enter changes in Project Record Documents.

### **3.7 MONTHLY REPORTING REQUIREMENTS**

- A. Provide monthly progress reports organized as stated below and including the following:
  1. Section 1 – Open Agenda Items.
    - a. This section shall include any and all items that require discussion and direction from the Owner and/or Architect, including any problems that may impact project budget or schedule. Contractor shall provide summary of such item(s) and proposed solutions, with associated impact of cost and schedule, if any, one (1) week prior to meeting. Contractor to schedule as appropriate to ensure no delay in project schedule.
  2. Section 2 – Executive Summary.
    - a. Brief Project Description.
    - b. Summary of Reporting for current Period.
    - c. Work to Commence Next Period.
    - d. Ongoing Work.
    - e. Milestone Schedule.
    - f. Safety.
    - g. Permit & Code Review.
  3. Section 3 – Budget.
    - a. Budget Summary, organized by trade.
    - b. Potential Change Order Log.



- i. If potential cost changes exist, justification shall be provided, including cost analysis, if not unit cost in bid proposal or schedule of values. Justification shall be provided from Contractor to Owner and Architect within 10 days of uncovering such potential cost change.
  - c. Copies of approved change orders for current period.
- 4. Section 4 – Schedule.
  - a. Overall Construction Schedule.
  - b. Detailed Two Week-Look Ahead Schedule.
  - c. If any delays are realized based on the initial project schedule, provide an explanation and cause of such delay, and statement of the course of action taken or contemplated to resolve such delay.
  - d. Material Procurement.
    - i. Material Procurement Log shall be created and maintained identifying any such material with a lead time exceeding four (4) weeks.
- 5. Section 5 – RFI Log and Submittal Log.
  - a. Outstanding RFI Log.
  - b. Summary of RFI's During Current Period.
  - c. Outstanding Submittal Log.
  - d. Summary of Submittals During Current Period.
- 6. Section 6 - Observation Log.
  - a. Items Noted During Current Period.
  - b. Previously Identified Items, with corrective action noted and date closed.
  - c. Observation Log shall also include all field orders.
  - d. Description of any other changes to the final construction documents.
- 7. Section 7 - Owner / Architect / Contractor (OAC) Meeting Minutes.
  - a. Inclusion of recorded meeting minutes from previous period.
- 8. Section 8 – Photographs.
  - a. Photographs of progress for current period.
- B. Provide reports to the Project Manager by the 15<sup>th</sup> of the month for the month preceding.

### **3.8 SECURITY PROCEDURES**

- A. Each contractor shall:
  - 1. Limit access to the site to persons involved in the work.
  - 2. Provide security for all tools, equipment, devices, etc. required or otherwise used for construction of this project, and for all materials which have been paid for by the Owner but not yet incorporated into the Work.
  - 3. Secure completed work as required to prevent loss.

### **3.10 COORDINATION DRAWINGS**

- A. Provide information required by Project Specifications for preparation of coordination drawings.
- B. Review drawings prior to submission to Architect.
- C. It shall be the responsibility of the Contractor to create and facilitate coordination drawings amongst all discipline trades (architectural, general trades, mechanical, electrical, fire alarm, plumbing, fire protection and structural) for hard clashes (clashes between elements) and soft clashes (clashes between elements and required clearances).
  - a. The Contractor will coordinate these drawings and provide any recommended resolution to clashes, interferences, or construction issues that do not impact the design intent of the project.
  - b. In instances in which there is impact to the design intent of the project, the Contractor shall submit a request for information (RFI) to the Architect and the Architect shall modify documents as appropriate to resolve the RFI.

### 3.11 SUBMITTAL PROCEDURES

- A. Submit a comprehensive submittal schedule as an insert in the submittal of the construction schedule or integrated into the construction schedule.
- B. Transmit each submittal with contractor's standard transmittal.
  - 1. Submittals will be accepted from the General Contractor only. Submittals received from other entities will be returned without review or action.
  - 2. Include referenced specification section.
- C. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- D. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- E. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and contract documents.
- F. Deliver submittals to Architect electronically to email designated by Architect
  - a. Shop Drawings, Submittals and Samples are logged in at the Architect's office not necessarily with the same date indicated by the General Contractor on the Transmittal. The response time will commence upon the date of receipt by the Architect.
    - i. Shop Drawings, Product Data and Samples received on or after a Friday after 2:00 PM will be dated received the following Working Day.
    - ii. Shop Drawings received on any day after 2:00 PM will be dated received the following Working Day.
- G. Schedule submittals to expedite the project, and coordinate submission of related items.
- H. Deliver each informational submittal prior to start of the work involved, unless the submittal is of a type which cannot be prepared until after completion of the work; submit promptly.
- I. If a submittal must be processed within a certain time in order to maintain the progress of the work; state so clearly on the submittal.
- J. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
  - 1. Allow a minimum of 1 week for processing of resubmittals.
- K. If a submittal must be delayed for coordination with other submittals not yet submitted, the architect may at their option wither return the submittal with no action or notify the contractor of the other submittals which must be received before the submittal can be reviewed.
- L. Identify variations from contract documents and product or system limitations which may be detrimental to successful performance of the completed work.
- M. Provide space for Contractor and architect review stamps.
- N. When revised for resubmission, identify all changes made since previous submission.
- O. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- P. Submittals not requested will not be recognized or processed.
- Q. Submittals will be reviewed, marked with appropriate action, and returned.
  - a. Architect will review submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
  - b. Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked to indicate the action taken.
  - c. Review Stamp Terminology: Correction or comments made on shop drawings during this review do not relieve contractor from compliance with requirements of the Drawings and Specifications. This review is conducted only for the confirmation of general conformance with the design concept of the Project and general compliance with the information given in the Contract Documents.
    - a. The Contractor is responsible for:
      - i. Confirming and correlating all quantities and dimensions.
      - ii. Selecting fabrication processes and techniques of construction.
      - iii. Coordinating his work with that of all other trades.

- iv. Performing his work in a safe and satisfactory manner.
- d. Stamped "action" markings:
  - 1. "Reviewed" action: Submittal has been reviewed for compliance with construction documents, no additional action necessary.
  - 2. "Reviewed with Comments" - where comments indicated on submittal qualifying, modifying, or otherwise changing it; however, submittal can be used for ordering, fabrication and erection. "Revise and Resubmit" action: Submittal not in conformance, revise the submittal or prepare a new submittal complying with the comments made. Do not proceed with work items as shown on the submittal until a "revised and resubmitted" submittal has been review for compliance with construction documents by the Architect.
  - 3. "Rejected" action: Submittal not required or not in conformance. Prepare a new submittal complying with specified requirements. Do not proceed with work items related to submittal until new submittal has been approved by the Architect.
  - 4. "Submit Record Copy" -Provide record copy of submittal with comments picked up.
- e. Other Action: Where a submittal is primarily for information or record purposes, for special processing or other Contractor activity, the submittal will be returned, marked "Action Not Required".
- R. Submit same information noted within this section electronically if project team is utilizing electronic software for document management.
- S. Use of Contract Drawings
  - a. The Architect may provide electronic CAD files of Drawings to the Contractor and Sub-Contractors, upon request, for use as backgrounds in preparation of Contractor's Shop Drawings for this Project ONLY.
  - b. The Architect will provide electronic base files of Floor Plans, Reflected Ceiling Plans, and Elevations ONLY. Wall sections and details WILL NOT be released. Contract document files WILL NOT be released.
  - c. The Contractor shall read, endorse, and return the Architect's waiver form, "Authorization for Release of Electronic File Transfers", prior to release of any electronic CAD files by the Architect. A copy of the Waiver Form is included at the end of this Section.
  - d. The release of electronic CAD files by the Architect is solely for the convenience of the Contractor. The Architect shall not be responsible for the completeness or accuracy of these electronic CAD files. These electronic CAD files are not necessarily updated to reflect subsequent Bid Packages, addenda, bulletins, or other project revisions.

### 3.12 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
  - 1. Product Data.
    - a. Submit manufacturer's standard printed data sheets.
    - b. Identify the particular product being submitted; submit only pertinent pages.
    - c. Identify applicable options and accessories.
    - d. Show compliance with the specific standards referenced.
    - e. Show compliance with specified testing agency listings; show the limitations of the labels or seals.
    - f. Identify dimensions which have been verified by field measurement.
  - 2. Shop Drawings.
    - a. Drawn to scale and scale noted on drawings.
    - b. Names of specific products and materials used.
    - c. Field measurements that have been taken, at accurate scale.
    - d. Details, identified by contract document sheet and detail numbers.
    - e. Coordination requirements; show relationship to adjacent or critical work.
    - f. Reproductions of contract documents are not acceptable as shop drawings.
    - g. Space for architect's action marking shall be adjacent to the title block.

3. Sample for Selection.
  - a. Provide samples that are the same as proposed product.
  - b. Provide sufficient quantity to properly illustrate full range of color, texture, or other variation that may be expected in finished work.
  - c. Tag with the following information: name of Architect, project title, contractor manufacturer, and supplier, and brand name or number identification, pattern color or finish designation.
- B. Review and Coordinate submittals prior to submission to Architect.
- C. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- D. Samples will be reviewed only for aesthetic, color, or finish selection.
- E. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7000- Execution Requirements.
- F. Refer to attached copy of the Schedule of Submittals for a summary of submittals required for this project. This schedule is provided for convenience only and does not alleviate the Contractor of the responsibility for complying with submittal requirements of each section.

### **3.13 FIRE HAZARD CLASSIFICATION SUBMITTALS**

- A. Fire hazard classifications for materials as specified in the technical specification shall be those established by publication in Current Building Materials List published by Underwriters' Laboratories, Inc., or certified to by notarized affidavit from Southwest Research Institute, or other agency acceptable to the State Construction Code Commission.
- B. Compliance: Where compliance is established by publication in Building Materials List, Trade Contractor shall so represent in writing to the Contractor.
  1. Affidavit:
    - a. Where compliance is to be established by affidavit, Trade Contractor shall submit properly notarized affidavit that the material has been tested in accordance with requirements of ASTM E84, ASTM E119, or other specified standard, and found to quality for the specified classifications.
    - b. The affidavit for testing is to be certified by the manufacturer for material and by the installer for installation.
    - c. Affidavit shall state the name of the testing agency.
    - d. Six copies of affidavits and other representations of compliance shall be submitted to the Contractor at time of shop drawing or sample submittal, whichever comes first.

### **3.14 FIRE MARSHAL AFFIDAVITS**

- A. The requirements specified hereinafter refer to compliance with Codes and regulations of governing authorities referred to in Section 01 1000 "Summary".
- B. Submit in triplicate, notarize affidavits for the products required as specified in the various technical sections of the specifications. Affidavits shall be submitted to the appropriate Office of Fire and Safety field office responsible for the project. Affidavit shall be signed and notarized, an in the following format:
  1. AFFIDAVIT
    - a. This is to clarify that, (Name of Product) which was or will be furnished to (Company making Application of Product) for (Job or Project Name and Address) is the same in all respects in content, and specifications for mixing and/or application as the specimen tested by (Name of Lavatory) on their project or test number (Test Number) dated (Date of Test).
      - 1) Flame Spread \_\_\_\_\_
      - 2) Fuel Contributed \_\_\_\_\_
      - 3) Smoke Developed \_\_\_\_\_

### **3.15 SUBMITTALS FOR INFORMATION**

- A. When the following are specified in the individual sections, submit them for information:
  - 1. Design data.
  - 2. Certifications.
  - 3. Test reports.
  - 4. Inspection reports.
  - 5. Manufacturer's instructions.
  - 6. Manufacturer's field reports.
  - 7. Permits, Licenses and Certifications: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.
  - 8. Submit for Architect's knowledge as contract administrator or for Owner.

### **3.16 NUMBER OF COPIES OF SUBMITTALS**

- A. Documents for Review: All drawings submitted shall be drawn to scale and scale noted on drawings.
  - 1. Small Size Sheets, not larger than 8-1/2 x 11 inches: Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Architect plus one copy to be retained by Owner.
  - 2. Larger sheets, not larger than 24 x 36 inches: Submit the number of copies which Contractor requires, plus two copies which will be retained by the Architect.
  - 3. Larger Sheets, not larger than 36 x 48 inches: submit the number of opaque reproductions which Contractor requires, plus two copies which will be retained by Architect.
- B. Documents for Information: Submit two copies
  - 1. No copies will be returned unless action is required.
- C. Documents for Project Closeout: Make two reproductions of submittal originally reviewed. Submit one extra of submittals for information.
- D. Sample: Submit the number of samples which the Contractor requires, plus two samples which will be retained by the Architect.
- E. Retained samples will not be returned to Contractor unless specifically so stated.

### **3.17 DOCUMENTS FOR PROJECT CLOSEOUT**

- A. When the following are specified in individual sections, submit them at project closeout:
  - 1. Project record documents.
  - 2. Operation and maintenance data.
  - 3. Final approved shop drawings and submittals.
  - 4. Warranties.
  - 5. Bonds.
  - 6. Affidavits of fire ratings for all finish materials and products as required by the State of Michigan.
  - 7. Other types as indicted.
- B. Submit for Owner's benefit during and after project completion.
- C. All documents required for project closeout shall also be submitted electronically, in Adobe PDF format, and bookmarked per CSI 2004 format.

### **3.18 PROJECT RECORD DOCUMENTS**

- A. General Contractor shall mark a set of prints so as to keep an accurate, on-going record of all deviations from the approved design drawings and specifications which may occur in the work as actually constructed. Give particular attention to information on concealed work which might be difficult to identify or measure and record at a later date. Mark up whichever drawing is most capable of showing the actual "field" condition fully and accurately; however, if shop drawings are used for mark-up, record a cross-reference at the corresponding location on the working drawings.

- B. Where the actual work differs from that shown on the drawings, mark this set to show the actual work.
  - 1. Mark location of concealed items before they are covered by other work.
  - 2. Mark either record contract drawings or chop drawings, whichever are best suited to show the change.
  - 3. Note related change-order number where applicable.
- C. General Contractor shall not use record set of drawings for construction purposed unless set can be kept reasonably clean and net. If necessary (Architect to be sole judge), contractor shall purchase from Architect/Engineer a new set of blue/black-line prints near completion of job for purpose of transferring change notations from job prints to new set of record prints. This set will constitute "Record Documents".
- D. Maintain record documents in a secure location at the site while providing for access by the Contractor and the architect during normal working hours.
- E. Job superintendent shall himself maintain set of record document submittal or this task shall be assigned to some other responsible person.
- F. Record information as soon as possible after it is obtained.
- G. Record the following types of information on all applicable record documents these documents shall include Drawings and Specifications:
  - 1. Addenda, note identification numbers if applicable.
  - 2. Change orders and other modification to the Contract, note identification numbers if applicable.
  - 3. Final approved shop drawings, product data, and samples.
  - 4. Dimensional changes.
  - 5. New and revised details.
  - 6. Measured depths of foundations in relation to finish first floor datum.
  - 7. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - 8. Actual sizes and routing of ducts, piping and conduits.
  - 9. Revisions to electrical circuits.
  - 10. Actual equipment locations.
  - 11. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  - 12. New information which may be useful to the Owner, but which was not shown in either the contract documents or submittals.
  - 13. Legibly mark and record at each product section description of actual products installed, including the following:
    - a. Manufacturer's name and product model and number.
    - b. Product substitutions or alternates utilized.
    - c. Changes made by Addenda and modifications.
- H. Keep drawings in labeled, bound sets.
  - 1. Mark with red erasable pencil.
  - 2. Mark work of separate contracts with different colors of pencils.
  - 3. Incorporate new drawings into existing sets, as they are issued.
- I. Where record drawings are also required as part of operation and maintenance data submittals, copy marks to another opaque print obtained from the Architect.
- J. Transmittal to Owner:
  - 1. Collect, organize, label, and package ready for reference.
    - a. Label document with "PROJECT RECORD DOCUMENTS – This document has been prepared using information furnished by "\_\_\_\_" (insert the contractor's name), and the date of preparation.
  - 2. Submit to the Architect for transmittal to the Owner, unless otherwise indicated.
  - 3. Final payment will not be made until all record documents are properly completed and delivered to the Architect for transmittal to Owner.
- K. Ensure entries are complete and accurate, enabling future reference by Owner.

- L. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction.

### **3.19 OPERATION AND MAINTENANCE DATA**

- A. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

### **3.20 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES**

- A. For Each Product, Applied Material, and Finish:
  - 1. Product data, with catalog number, size, composition, and color and texture designations.
  - 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Provide a listing on Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

### **3.21 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS**

- A. For Each Item of Equipment and Each System:
  - 1. Description of unit or system, and component parts.
  - 2. Identify function, normal operating characteristics, and limiting conditions.
  - 3. Include performance curves, with engineering data and test.
  - 4. Complete nomenclature and model number of replaceable parts.
- B. Panelboard Circuit Directions: Provide electrical service characteristics, controls and communications; typed.
- C. Include color coded wiring diagrams as installed.
- D. Operating Procedures: Include start-up. Break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- F. Provide servicing and lubrication schedule, and list of lubricants required.
- G. Include manufacturer's printed operation and maintenance instructions.
- H. Include sequence of operation by controls manufacturer.
- I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- J. Provide control diagrams by controls manufacturer as installed.
- K. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

- N. Include test and balancing reports.
- O. Additional Requirements: As specified in individual product specification sections.

### **3.22 OPERATION AND MAINTENANCE MANUALS**

- A. Prepare instruction and data by personnel experienced in maintenance and operation of described products.
- B. Prepare data in the form of an instructional manual.
- C. Binders: Commercial quality, 8-1/2 x 11 inch three ring binders with durable plastic covers; 3 inch maximum ring size, with pocket folders for folded sheet information. When multiple binders are used, correlate data into related consistent groupings. Mark the appropriate identification on both front and spine of each binder.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.
- F. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- H. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
- I. Contents: Prepare a table of Contents for each volume, with each product or system description identified, in three parts as follows:
  - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
  - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and Suppliers.
    - a. Significant design criteria.
    - b. List of equipment.
    - c. Parts list for each component, with ordering data.
    - d. Product data giving equipment and function description, with normal operation characteristics and limiting conditions.
    - e. Starting, operating, and troubleshooting procedures.
    - f. Emergency instructions.
    - g. Cleaning and maintenance requirements and procedures.
    - h. External finish maintenance requirements.
    - i. List of maintenance materials required.
    - j. List of special tools required.
    - k. Recommended quantity of spare parts to be maintained in storage.
    - l. Wiring diagrams.
    - m. Local source of replacements, replaceable parts and supplies.
    - n. Operating instructions.
    - o. Maintenance instruction for equipment and systems.
    - p. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
  - 3. Part 3: Project documents and certificates, including the following:
    - a. Shop drawings and product data.
    - b. Air and water balance reports.
    - c. Certificates.
    - d. Photocopies of warranties and bonds.
- J. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.



- K. Table of contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.
- L. All documentation required above shall also be submitted electronically, in Adobe PDF Format, and bookmarked per CSI 2004 format.
- M. Final payment will not be made until all record documents are properly completed and delivered to Architect for transmittal to Owner.

**END OF SECTION 01 3000**

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## **AUTHORIZATION FOR RELEASE OF ELECTRONIC FILE TRANSFERS**

**DIGITAL DATA FILES INCLUDE 3D BUILDING INFORMATION MODELING (BIM) FILES AND 2D AUTOCAD FILES**

Project Name

Project Number

Date Issued

Documents Issued

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## AUTHORIZATION FOR RELEASE OF ELECTRONIC FILE TRANSFERS

Project Name  
Project Number  
Date  
Page 2

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Neumann/Smith Authorization

Recipient Acceptance

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Organization

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Signature

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Name

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Name

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Title

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Title

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Date

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Date

Copies:

Neumann/Smith Project File

Client's Representative

## **SECTION 01 4000 – QUALITY REQUIREMENTS**

### **PART 1 GENERAL**

#### **1.1 RELATED SECTIONS**

- A. Section 01 6000 – Product Requirements: Requirements for material and product quality.
- B. Section 00 7000 – General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- C. Section 01 3000 – Administrative Requirements: Submittals procedures, shop drawings, product data, and sample.
- D. Section 01 7000 – Executive Requirements: Contract closeout procedures.
- E. Section 01 4340 – Mockups and field Quality Control Testing.
- F. Individual Product Sections: Specific requirements for operation and maintenance data.
- G. Individual Product Sections: Warranties require for specific products or Work.

#### **1.2 REFERENCES**

- A. ASTM C 1021 – Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2001.
- B. ASTM C 1077 – Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2003a.
- C. ASTM C 1093 – Standard Practice for Accreditation of Testing Agencies for Unit Masonry; 1995 (Reapproved 2001).
- D. ASTM D 3740 – Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2001.
- E. ASTM E 329 – Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction; 2003.
- F. ASTM E 543 – Standard Practice for Agencies Performing Nondestructive Testing; 2002.

#### **1.4 REFERENCES AND STANDARDS**

- A. The following documents are considered to be part of the contract and must be accessed by the Contractor at the websites listed below.
  - 1. Central Michigan University Design Standards located at: <https://www.cmich.edu/offices-departments/finance-administrative-services/facilities-management/university-engineering-and-planning/design-standards>

#### **1.5 SPECIAL INSPECTIONS**

- A. The contractor will be required to coordinate the testing schedule, timing, etc. Testing shall include, but not limited to, the following types of construction.
  - 1. Concrete constructions.
  - 2. Structural steel constructions.
- B. Refer to technical specifications for additional information on testing and inspection responsibilities.

#### **1.6 TESTING AND INSPECTION AGENCIES**

- A. The Architect shall create scope of work, issue testing bid documents and make recommendations to the Owner. The Owner will issue and hold contract with the testing agency.

The following is a list of acceptable agencies:

- 1. Driesenga & Associates  
7989 Mackinaw trail  
Cadillac, MI 49601  
P: (616) 775-7769  
F: (616) 775-XXXX

2. Materials Testing Consultants  
693 Plymouth Ave. NE  
Grand Rapids, MI 49546  
P: (616) 465-5469  
F: (616) 456-5758
  3. McDowell & Associates  
3730 James Savage Rd  
Midland, MI 48642  
P: (989) 496-3610  
F: (989) 496-3190
  4. Professional Service Industries, Inc.  
45749 helm St  
Plymouth, MI 48170  
P: (734) 453-7900  
F: (734) 453-0724
  5. Pro-MED Engineering Services, Inc.  
109 E. Lincoln St.  
Grand Ledge, MI 48837  
P: (517) 627-8532  
F: (517) 627-2562
  6. Soil & Materials Engineers, Inc.  
1501 W. Thomas St.  
Bay City, MI 48706  
P: (989) 684-6050  
F: (989) 684-0210
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Contractor Employed Agency:
1. Testing agency: Comply with requirements of ASTM E 329, ASTM E 543, ASTM C 1021, ASTM C 1093 and ASTM D 3740.
  2. Inspection agency: Comply with requirements of ASTM D 3740 and ASTM E 329.
  3. Laboratory Staff: Maintain a full-time registered Engineer on staff to review services.
- D. Testing Equipment: calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.
- E. Refer to applicable specification sections for Inspection schedule and additional information on testing and inspection responsibilities.

#### **1.7 COORDINATION**

- A. Cooperate with other entities performing quality control activities.
- B. Provide samples of materials and design criteria as indicated and when requested.

#### **1.8 SEQUENCING**

- A. The Contractor shall coordinate quality control activities to avoid delay and to make it unnecessary to uncover work for testing or inspection.
- B. No claims for extension of time or additional costs will be allowed due to testing activities.

#### **PART 2 PRODUCTS – NOT USED**

## **PART 3 EXECUTION**

### **3.1 CONTROL OF INSTALLATION**

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. The Contractor shall maintain and manage an observation log of all quality control issues including input from the Contractor, Architect, Owner, and consultants including but not limited to the inspection and testing agency, with the exception of the Commissioning Agent. A separate commissioning log will be maintained and managed by the Commissioning Agent. The intent is to ensure all construction is completed in a good and workmanlike manner, to the industry standards of quality, fit, and finish, and in accordance with all legal requirements and the Contract Documents.
- C. Comply with manufacturers' instructions, including each step in sequence.
  - 1. Keep a record of instructions and recommendations which supplement or conflict with the manufacturer's written instructions.
- D. Should manufacturers' instruction conflict with Contract Documents, request clarification from Architect before proceeding with the project.
- E. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- F. Have Work performed by persons qualified to produce required and specified quality.
- G. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- H. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

### **3.3 TESTING AND INSPECTION**

- A. See individual specification sections for additional information regarding field testing.
- B. Inspections: If any laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested or approved, the Contractor doing the work shall be responsible for arranging, providing, and paying for such inspections, testing or approval requirements.
- C. Testing Agency Duties:
  - 1. Test samples of mixes submitted by Contractor.
  - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
  - 3. Perform specified sampling and testing of products in accordance with specified standards.
  - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  - 5. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
  - 6. Perform additional tests and inspections required by Architect.
  - 7. Attend preconstruction meetings and progress meetings.
  - 8. Submit reports of all tests/inspections specified.
- D. Limits of Testing/Inspection Agency Authority:
  - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  - 2. Agency may not approve or accept any portion of the Work.
  - 3. Agency may not assume any duties of Contractor.
  - 4. Agency has no authority to stop the Work.
- E. Contractor Responsibilities:
  - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
  - 2. Cooperate with laboratory personnel and provide access to the Work and to manufacturers' facilities.
  - 3. Provide incidental labor and facilities:

- a. To provide access to Work to be tested/inspected.
  - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
  - c. To facilitate tests/inspections.
  - d. To provide storage and curing of test sample.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- F. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect. Payment for re-testing will be charged to the Contractor by deducting testing charges from the Contract Price.
- G. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Owner.
  1. Submit copies directly to governing authorities when so directed.
  2. Include:
    - a. Date issued
    - b. Project title and number.
    - c. Name of inspector.
    - d. Date and time of sampling or inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.
    - g. Type of test/inspection.
    - h. Date of test/inspection.
    - i. Results of test/inspection.
    - j. Conformance with Contract Documents.
    - k. When requested by architect, provide interpretation of results.
  3. Test reports are submitted for Architect's knowledge as contract administrator or for the Owner, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

### **3.4 MANUFACTURERS' FIELD SERVICES**

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect 30 days in advance of required observations.
  1. Observer subject to approval of Architect.
  2. Observer subject to approval of Owner.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

### **3.5 DEFECT ASSESSMENT**

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

### **3.6 PROTECTION AND REPAIR**

- A. When work is uncovered during quality control activities, provide protection from damage.
- B. Correct work damaged by quality control activities; where repair is indicated as an unacceptable method, replace the work.

## **END OF SECTION 01 4000**



## **SECTION 01 4216 - DEFINITIONS**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. This Section defines various terms used throughout the Contract Documents.

#### **1.03 DEFINITIONS**

- A. Addendum: An Addendum is a written and/or graphic instrument issued by the Owner's Representative prior to award of Contract which modifies or interprets the Bidding Documents by additions, deletions, clarifications, or corrections. The Bidding Documents for the original Work shall govern the work described therein, unless modified by the Addendum. All costs or credits due to the Addendum shall be incorporated into the Bidder's Proposal Form for Addenda issued prior to the Owner's receipt of Bids, and by letter on Bidder's letterhead modifying Bid Form amounts for Addenda issued after Owner's receipt of Bids. Letter shall be signed by, and as for the original Bid Form submission.
- B. Alternate Price: A variation to the Base Bid amount stated on the Proposal Form to cover a variation in the Contract Requirements. If the Alternate Price is accepted by the Owner, the variation becomes a part of the Contract, and the amount quoted is then added to, or deducted from, the Lump Sum Base Bid amount to determine the Contract Sum. Variations may include a change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
- C. Awardee: A Bidder selected to enter into a Contract with the Owner for Work included under the Bidder's Proposal, until such time as he is awarded a Contract and becomes a Subcontractor to the General Contractor.
- D. Base Bid: The Bid amount before any Alternate Price or Substitution is considered.
- E. Bid: As used in the Instructions to Bidders: A Proposal prepared and submitted as required herein.
- F. Bidding Documents: A term used for the Advertisement, Instruction to Bidders, Proposal Form, Contract, Bid Security, and the proposed Contract documents including any and all addenda.
- G. Bulletin: A written and/or graphic instrument issued by the Owner's Representative, after award of the Contract, used to solicit a proposal for a change in the Work which may affect cost and/or time. The Contract Documents for the original Work Shall Govern the work described unless modified by the Bulletin. A Bulletin is NOT AN ORDER to do the work, But a request to submit a quotation. Changes to the Contract Amount or time shall be adjusted by a Construction Change Directive or Change Order.
- H. Complete: Where used, it shall mean "Complete with connections, supports, attachments, and incidental items necessary for a finished and properly operating assembly or operation".
- I. Connect: The term shall mean "to bring service(s) to point of installation and make final connections of the service(s) to the installed equipment, and provide miscellaneous auxiliary appurtenances necessary to make operable for its intended use."
- J. Construction Issue: A written and/or graphic instrument issued by the Owner's Representative to provide the General Contractor a method for obtaining expedient additions, revisions, or clarifications of Drawings and Specifications during the Design and Construction process.
- K. Contract Documents: Drawings and Specifications setting forth in detail the requirements for construction of the Project.
- L. Days and/or Calendar Days: Days listed on the calendar, including Saturdays, Sundays, and legal holidays where the Project is located.

- M. Directed: Terms such as “directed”, “requested”, “authorized”, “selected”, “approval”, “satisfactory”, “accepted”, “required”, and “permitted” are used without reference to specific entity, they shall mean “as directed by the Architect or General Contractor”, and similar phrases. However, no implied meaning shall be interpreted to extend the Owner’s, Architect’s, or General Contractor’s responsibility into the Contractor’s area of construction supervision, administration, means, or methods.
- N. Drawing: Plans, Sections and detail drawings, both large and small scale, furnished by the Architect for the purpose of giving instructions and showing the Work to be done.
- O. Experienced: Unless otherwise defined in the technical specifications, means having successfully completed a minimum of 5 previous Projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with the requirements of authorities having jurisdiction.
- P. Field Order: A directive to make changes in the Work that is issued to the General Contractor. Contractual obligations are the same as those for a Construction Change Directive.
- Q. Furnish: To supply (only) to another party for their use or installation, including cost of delivery to the jobsite.
- R. Hours of Work: Standard hours of work for the Project shall be proposed by the Subcontractor, subject to approval of the General Contractor, and shall be for all standard working days. Hours of work other than these “standard hours of work” will be considered “premium time hours” and shall include, if any, cost penalty. Work to be performed on “premium time hours” requires written permission from the Owner’s representative and shall be requested a minimum 48 hours prior to such need.
- S. Indicated: Graphic representations, notes, or schedules on the Drawings, or other Paragraphs or Schedules in specifications, and similar requirements in the Contract Documents. Where terms such as “shown”, “noted”, “scheduled”, and “specified” are used, it is to help locate the reference. No limitation on location is intended except as specifically noted.
- T. Install: To unload, temporarily store, distribute, uncrate, unpack, assemble, erect, and anchor into the intended final positions. The installer shall provide all miscellaneous hardware and supplies required to anchor and support securely, connect, clean-up, and dispose of rubbish.
- U. Installer: The Contractor or entity engaged by the Contractor, as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
- V. Not-In-Contract / NIC: Work not included in this Contract.
- W. Owner’s Representative: The General Contractor is to act in the Owner’s behalf with regard to the work used in reference hereto.
- X. Packaged Equipment: Equipment or Product that is complete with all integral components, including, but not limited to, piping, conduit, wiring, main power disconnect, starter, control transformer, relays, and controls fully mounted and completely interconnected ready for installation at final location and to receive final connection of mechanical and electrical services. For shipping of “Packaged Equipment” too large for completed assembly, the assembly may be “broken down” into shippable subassemblies requiring only minimal reassembly, refastening, reconnection, etc. Any piping and/or electrical connections required between subassemblies shall be provided with quick-connect fittings which do not require special tools to secure the connections.
- Y. Per: “in accordance with the requirements of”.
- Z. Plan(s): The terms shall read to mean “Contract Drawings”.
- AA. Product: Materials, systems, and equipment.
- BB. Project: The total construction of which the work performed under the Contract Documents may be the whole or a part.

- CC. Project Manual: The volume(s) assembled for the Work which may include Introductory Information, Bidding Requirements, Contract Forms, Conditions of the Contract, the Specifications, and Reference Materials.
- DD. Project Site / Site: The space available for the Contractor for performance of 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 upon which the Project is to be built.
- EE. Provide: To furnish, install, and connect, complete and ready for intended use.
- FF. Regulations: Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- GG. Request for Information (RFI): A request for information by the Contractor to the Architect of Record for clarification of intent of any portion of the Contract Documents after the Award of Contract and during the construction of the Project.
- HH. Review: Where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the duties and responsibilities of the Architect as stated in the General Conditions and Supplementary Conditions. Such review shall not release the Contractor from responsibility to fulfill Contract requirements unless otherwise provided in the Contract Documents.
- II. Supplier: As used herein; A firm or organization furnishing or delivering products directly to the jobsite, and because of such direct delivery, could be construed under the lien laws of the State in which the work is being performed as having lien rights against funds due the Contractor. Suppliers of materials and equipment, delivering to Contractor or Subcontractor on an open account basis and not having lien rights on the Work, will not be considered suppliers within the meaning of the Contract Documents.
- JJ. Testing Agency: 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.
- KK. Trades: The use of titles such as "Carpentry" is not intended to 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.
- LL. Trade Specialists: Certain Sections of the Specifications require that specific construction activities be performed by specialists who are recognized experts in the operations to be performed. The Specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option.
- MM. Unit Price: An amount proposed by Bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to, or deducted from, the Contract Sum by appropriate modification, if the estimated quantities of Work required by the Contract Documents are increased or decreased.
- NN. Work: (Capitalized) The construction services required by the Contract Documents, whether completed or partially completed, and including all other labor, materials, equipment and other services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or part of the Project.
- OO. work: (Lower Case) Activity to do or perform something, a specific task being a part or phase of some larger activity, or something that results from a particular manner or method, working, operating, or devising.

PP. Working Days: Standard working days for the Project shall be all calendar days except Saturdays, Sundays, and legal holidays where the Project is located and shall invoke no cost or time penalties. Working days other than "standard working days" will be considered "premium working days" and shall include, if any, cost penalty. Work to be performed on "premium working days" requires written permission from the Owner's Representative, and shall be requested a minimum 48 hours prior to such requirement.

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

## **SECTION 01 5000 – TEMPORARY FACILITIES AND CONTROLS**

### **PART 1 GENERAL**

#### **1.1 DEFINITIONS**

- A. Temporary Facilities: Construction, fixtures, fittings, and other built items required to accomplish the work but which are not incorporated into a finished work.
- B. Temporary Utilities: A type of temporary facility; primary sources of electric power, water natural gas supply, etc., obtained from public utilities, other main distribution systems, of temporary sources constructed for the project, but not including the fixtures and equipment served.
- C. Temporary Services: Activities required during construction which do not directly accomplish the work.
- D. Construction Equipment: A type of temporary facility, consisting of fixed equipment use to accomplish the work, determined by the method the contractor chooses to accomplish the work.

#### **1.2 SUBMITTALS**

- A. Reports of inspections, test, and approvals for the installation and use of construction facilities, which are made or given by public authorities.
- B. Copies of permits required by public authorities.

#### **1.3 QUALITY ASSURANCE**

- A. Comply with requirements of governing authorities, as to type, quantity, location, and use of temporary facilities and services.
- B. Comply with requirements of public utilities affected.

#### **1.4 PROJECT CONDITION**

- A. The “General Contractor” shall maintain control regarding the installation, connections to and maintenance of equipment used in providing temporary services to the site. The “using contractor” shall make arrangements with the General Contractor for services used during course of project until permanent system of building is in operation.
- B. The General Contractor shall coordinate the connections to the Owner’s existing energy systems to be used for temporary and/or permanent system usage. The Owner will pay for energy used from the existing systems.
  - 1. The General Contractor shall regulate and control the use of all utilities so as to not needlessly waste water or energy without proper regard for conservational or ecological consideration.
- C. The contractor requiring easements shall obtain easements where required.
  - 1. That contractor shall pay all necessary fees for required easements, and said fees shall be included in contractor’s proposal amount.
- D. Each permanent facility used for construction purposes shall be operated, maintained, and protected during such use by the original installer.
  - 1. Specified warranties shall not be reduced or voided by temporary use.

#### **1.5 SEQUENCING AND SCHEDULING**

- A. Remove facilities before substantial completion.

#### **1.6 TEMPORARY UTILITIES – GENERAL**

- A. Water and electrical energy will be made available only as they presently exist. Provide and pay for such connections to, extensions from, and means of using these utilities as ay be required.

**1.7 TEMPORARY ELECRCITY**

- A. Cost: By Owner.
- B. Connect to Owner's existing power service.
  - 1. Do not disrupt Owner's need for continuous and safe service.
  - 2. Exercise measures to conserve energy.
- C. Provide temporary electric feeder from existing building electrical service at location as directed.
- D. Complement existing power service capacity and characteristics as required.
- E. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.
- F. Provide main service disconnect and over-current protection at convenient location and meter.
- G. Permanent convenience receptacles may be utilized during construction.
- H. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.
  - 1. Provide 20 ampere duplex outlets, single phase circuits for power tools for every 500 sq. ft. of active work area.
  - 2. Provide 20 ampere, single phrase branch circuits for lighting.
- I. Electrical Trades shall provide temporary service for light and power required for construction by all trades until permanent system is in operation. All materials, procedures, installations, etc. shall be in full compliance with requirements of Part 17, Electrical Standards, of Rules for Construction Safety issued pursuant to Michigan Occupational Safety and Health Act.
- J. Provide 120/240V, single phrase, three-wire service and branch wiring per O.S.H.A. Lighting Standard, Subpart D, Rule 1926.56 (a) and (b) for 120V lighting and small tool power outlets throughout building addition.
- K. General lighting, consisting of 150 watt (minimum) lamps and weatherproof sockets, and power outlets, consisting of 120 volt pendant type cord connectors for fractional horsepower electrical tools, shall be installed. However, incandescent lighting will be kept to a minimum for proposes of energy conservation. All incandescent lighting should be dimmed 10% to increase lamp life. Incandescent lamps shall be 125-volt inside frosted. Fluorescent fixtures or compact Fluorescent are preferred by the University. Commercial fluorescent fixtures shall be all metal with hinged shielding louver or lens. Hinges shall operate and release without deforming louver.
- L. Interior lighting shall be shielded so as not to spill off the construction site.
- M. Lamp holders shall be rubber covered, hard-usage type with soldered pigtail connections properly taped and threaded sockets.
- N. Provide maintenance service for temporary power and lighting facilities (including lamps) during regular working hours. Any additional maintenance service required during overtime work, on Saturdays, Sundays, or holidays shall be arranged for and paid by Trades requiring same.
- O. If any workers require additional extensions in order to properly complete their work, they shall furnish their own cords, lamps, connectors, etc. as their needs require.
- P. All construction power tools shall be fed from temporary power source only.
- Q. Electrical trades shall provide temporary connections for testing or operating permanent new fan motors, pumps, burners, unit heaters, motors, and similar units, when temporary heat or ventilation is required during construction.
- R. After installation of permanent lighting system, it may be used for construction lighting as required.
- S. Temporary feeder cables from main disconnects to panels shall be routed through building and securely fastened to structure. Care should be taken to incorporate temporary feeder with permanent line, if possible.
- T. Complete installation shall be in compliance with all applicable codes. Electrical Contractor's cost will allow removal and salvage of temporary service when it is no longer required.

**1.8 TEMPORARY LIGHTING FOR COSTRUCTION PURPOSES**

- A. Temporary Lighting shall comply with CMU Design Standards, Division 26 – Electrical.
- B. Permanent building lighting may be utilized during construction.
- C. Maintain site walkway lighting as indicated on Drawings.

**1.9 WEATHER PROTECTION**

- A. All temporary enclosures, heating devices, fuel, etc. and all labor and services required therefore to protect materials in storage, work in progress and completed construction from damage to defacement due to any usual or unusual condition(s) of weather prior to time that building is completely and permanently enclosed (all exterior building construction – walls, doors, windows, louvers, roofs, etc. – 100% complete and weathertight) shall be considered “Weather Protection”.
- B. General Contractor shall provide and maintain weather protection as may be required by all trades to properly protect work from damage during construction. Heat shall be maintained around clock (24 hours per day, seven days per week) as necessary to fully meet contract requirements.

**1.10 TEMPORARY HEATING**

- A. All heating requirements for construction after building is completely and permanently enclosed (see WEATHER PROTECTION) and prior to acceptance or occupancy of building by Owner shall be classified temporary heat.
- B. Except as provided in paragraphs following the General Contractor shall provide all temporary heat required for proper and timely completion of total project. This shall include temporary space heaters with vent pipes, adequate controls, fuel, attendants, supervision, etc.
- C. Except as required by specific finish trades specifications, temperature within building shall be maintained at not less than 50 degrees F during working hours and at not less than 40 degrees F at all other times. General Contractor shall provide six (6) project thermometers, one (1) outside and five (5) inside building. These shall be used by Owner, Architect/Engineer, and Contractor to monitor temperature heating period.
- D. Mechanical Trades shall provide early use of all or part of permanent heating system for supplementary heating subject to approval by Architect/Engineer.
  - 1. NOTE: Term “Mechanical Trades” as used in the Section means Contractor (or subcontractor) for Building Mechanical Work.
- E. When permanent heating equipment is used for temporary heating, all units shall be fitted with disposable type filters which shall be changes at regular intervals as directed by Architect/Engineer. At end of temporary heating period and prior to being turned over to Owner, heating units shall be thoroughly cleaned and permanent filters installed. Mechanical tradesman shall be responsible for operation, maintenance, cleaning, and warranty of these units during temporary heating period.
- F. Owner will pay fuel bills for temporary heat provided by permanent heating system (only). Owner will not pay for fuel used in temporary heating devices.
- G. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
- H. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.
- I. Owner’s existing heat plant may be used.
  - 1. Exercise measures to conserve energy.
- J. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

**1.11 TEMPORARY COOLING**

- A. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.
- B. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.
- C. Owner's existing cooling plant may be used.
  - 1. Exercise measures to conserve energy.
- D. Prior to operation of permanent equipment for temporary cooling purposes, verify that installation is approved for operation, equipment is lubricated, and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

**1.12 TEMPORARY VENTILATION**

- A. Existing ventilation equipment may not be used.
- B. Contractor is responsible for cost associated with appropriate isolation of building HVAC system, separating the area of construction work and the adjacent occupied wet lab.

**1.13 TEMPORARY WATER SERVICE**

- A. Contractor requiring service shall make necessary arrangements with the Owner for use of water adequate for construction operations. All "arrangements" are to be included in base bid proposal.
- B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.
- C. Connect to existing water source.
  - 1. Exercise measures to conserve water.
  - 2. Provide separate metering.
- D. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.
- E. Piped water service:
  - 1. Do not use permanent piping system to distribute non-potable water.
  - 2. Connect to existing water main.
  - 3. Provide meter and shut-off valve.
  - 4. Disinfect temporary piping before use.
  - 5. Take precautions to prevent damage due to leaks and spills inside building.
- F. Connection shall include valve pit, valves, metering, piping, etc., necessary to comply with requirements of supplier, and shall conform to all applicable requirements of Federal, State, and Municipal regulations and authorities having jurisdiction. Distribution center shall be located in work area so as to provide maximum utility and minimal interference with execution of work.
- G. Supply of hoses, barrels or other equipment necessary to move water to work locations shall be responsibility of subcontractor requiring water. General Contractor may at their own discretion and expense install service lines from distribution center to site locations where major quantities of water will be required, if such lines are used try to position same so as to avoid interference with execution of work.
- H. Maintain service until building service is usable and acceptable to Owner's representative. Any damage to faucets or other items of building service, when use is permitted, shall be repaired. Damaged units shall be replaced without cost to Owner and to satisfaction of Owner's Representative.
- I. At completion of use: remove all lines, valves and other items, and arrange for backfilling of excavations for lines, pits, etc., as part of site restoration work for each particular areas.



**1.14 TEMPORARY SANITARY SERVICE FOR OWNERS USE**

- A. Provide temporary sanitary facilities for the duration of the restroom upgrade in Rooms Mens 120 and Womens 117. Provide one male and one female facility.
- B. Owner's facilities are not for Contractor use.
- C. Comply with governing regulations including safety and health codes for type, number, location, operation and maintenance of fixtures and facilities, but provide not less than specified requirements.
  - 1. Supply and maintain toilet tissue, paper towels, paper cups and similar disposable materials as appropriate for each sanitary facility, and provide appropriate wastes paper containers for used materials.
  - 2. Toilets: Provide self-contained toilet units shielded for privacy. Pit-type privies are not permitted.
- D. Coordinate location with Owner.

**1.15 TEMPORARY SANITARY SERVICE FOR CONTRACTOR USE**

- A. Comply with governing regulations including safety and health codes for type, number, location, operation and maintenance of fixtures and facilities, but provide not less than specified requirements. Install sanitary facilities in locations not visible to the general public which will best serve needs of personnel at project site.
- 3. Supply and maintain toilet tissue, paper towels, paper cups and similar disposable materials as appropriate for each sanitary facility, and provide appropriate wastes paper containers for used materials.
- 4. Toilets: Provide self-contained toilet units shielded for privacy. Pit-type privies are not permitted.
  - a. Use of Owner's facilities is not permitted.

**1.16 TELEPHONE SERVICE/DATA SERVICE**

- A. Maintain and pay for facsimile service, data and a dedicated telephone line to field office at time of project mobilization.

**1.17 BARRIERS**

- A. Provide barriers to prevent unauthorized entry to construction areas, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

**1.18 FENCING**

- A. Construction: Commercial grade chain link fence, 6' in height.
- B. Provide fence around construction site; equip with vehicular and pedestrian gates with locks as required to secure necessary ingress and egress from site and secure material laydown and storage.

**1.19 EXTERIOR ENCLOSURES**

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

**1.20 SECURITY**

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.

**1.21 VEHICULAR ACCESS AND PARKING**

- A. Coordinate access and haul routes with governing authorities and Owner.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. Designated existing on-site roads may be used for construction traffic.
- E. The Contractor shall be subject to all campus motor vehicle regulations and procedures while performing work under this Contract.
- F. Vehicles belonging to Contractors working on an active Central Michigan University project displaying a company logo do not need to acquire a parking permit. All vehicles used by the Contractor and their employees, that do not display a company logo, must adhere to the University Vendor Parking Permit Policy. Vendor Parking Permits are issued online by CMU Parking Services Self Service Portal: <https://parking.cmich.edu>.
- G. Contractors shall park in designated Central Michigan University parking lots. Contractors shall not park in handicap parking space unless they also display a valid handicap parking permit.
- H. Vehicles used for delivery of materials may be parked at the building site service area for unloading and loading purposes only.
- I. Vehicles shall not be parked on the "critical path" which serves persons with disabilities and other pedestrians, unless approved by the Project Manager, communicated to the campus community by the project manager and attended (by a person or guard to warn) or that has both visual and low auditory alarms.
- J. It is understood that Contractors may need to drive/park on sidewalks, stripped areas etc. for the purpose of loading or unloading. However, Contractors are expected to minimize the number of times this is done and the length of time they are parked there. Whenever possible Contractors shall avoid driving on the sidewalks and use alternate methods (e.g., hand buggies) to transfer materials. If driving on the sidewalk is required to access a building the Contractors shall unload material and tools and then move their vehicle to a designated Central Michigan University parking lot.
- K. Contractors are expected to protect CMU sidewalk, sprinkler systems and landscape; and shall repair any damage that occurs due to vehicles owned by the Contractor and their employees.
- L. Failure to use designated parking lots or areas or to follow rules will result in "Parking Citations" being issued for which the Contractor shall be solely responsible.

**1.22 WASTE REMOVAL**

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site at minimum on a weekly basis. Comply with Contract Documents and project Specifications.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

### 1.23 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 12 persons.
- C. Provide separate private office similarly equipped and furnished, for use of Architect and Owner's representative.
- D. Locate offices within the project fence lines.

### 1.24 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection
- B. Remove all temporary fencing including that installed under demolition contract to secure site.
- C. Remove all erosion control measures including those installed under the previous demolition package.
- D. Remove temporary underground installations to a minimum depth of 2 feet. Grade site as indicated.
- E. Clean and repair damage caused by installation or use of temporary work.
- F. Restore existing facilities used during construction to original condition.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. General: Provide materials which are both suitable for the use and durable enough to withstand the use and abuse to be expected.
- B. Temporary Heating Units: UL or FM labeled for the fuel used; do not use gasoline-burning open burning, or solid fuel heaters or salamanders.
  - 1. Use equipment that is known to be safe and that will not damage work in progress.

### 2.2 PROTECTIVE FACILITIES

- A. Contractor and each subcontractor shall at all times exercise every precaution for prevention of fire(s). Further, each shall make timely and adequate provisions for protection and safety of persons and property in event of fire.
- B. Fire Protection Facilities: Provide at least the temporary facilities required by the authorities having jurisdiction.
  - 1. Fire extinguishers to be installed in the completed building shall not be used during construction.
- C. Contractor and each subcontractor shall provide fire protection for their work. They shall furnish fire extinguishers and/or other firefighting devices, equipment, etc., of types and in such quantities as required.
- D. Whenever work of particularly hazardous nature is being done, party doing such work shall provide additional and/or special fire protection as may be required.
- E. Electrical arc welding and flame cutting equipment must be approved by Owner before they may be used within building. When welding or flame cutting is permitted, Contractor shall provide fulltime stand-by watchman, with fire-extinguisher mounted on cart or other means of transportation located immediately adjacent to work and ready for immediate use.
- F. Gas welding equipment **MAY NOT BE USED**. Gasoline torches or burners will not be permitted. When welding or flame cutting is permitted, contractor doing work shall provide full time stand-by watchmen with fire extinguisher mounted on cart or other means of transportation located immediately adjacent to work and ready for immediate use.
- G. All combustible trash, refuse, etc., MUST be removed from site and legally disposed of after each day's work.

### **2.3 EMPLOYEE FACILITIES**

- A. Toilet Facilities: General Contractor shall provide temporary toilets at the project site for all work trades personnel.
  - 1. Facilities shall be maintained in accordance with all applicable regulations, they shall be regularly cleaned and sanitize for duration of construction period.
  - 2. Work personnel will not be permitted to use new toilet facilities in the Owner's building.
    - a. Owner will not permit use of toilet facilities in existing buildings, unless otherwise stated.
- B. First Aid Facilities:
  - 1. The General Contractor shall provide and maintain temporary first aid facilities as required by OSHA, and other Federal, State, and local authorities, laws, ordinances and regulations.

### **2.4 STORAGE AND LAY-DOWN AREAS**

- A. Storage Facilities:
  - 1. General Contractor and major sub-contractors shall provide suitable storage and protection of tools and materials. All location of storage facilities are subject to final approval of Owner.
- B. Lay-Down and Storage Area:
  - 1. The Contractor will NOT be permitted to use the Owner's areas adjacent to the defined contract site.
  - 2. Space shall be confined to areas noted on documents.
  - 3. Contractor to document with photographs existing conditions prior to use of site. Contractor expected to return site to same condition prior to mobilization.

### **2.5 CONSTRUCTION HOISTS:**

- A. Provide temporary hoists, stairs, ladders, staging and similar items required for safe and efficient performance of work by all personnel of Contractor, subcontractors and separate Contractors engaged in quality control or similar operations connected with work. Maintain all such items in good condition and operating efficiently at all times during course of work. All such items shall conform to all applicable Federal and State Laws and Municipal ordinances, etc.
- B. Do not overload any part of structure so as to endanger its safety during hoisting operation. This is particularly applicable to roof surface, during hoisting operations.
- C. Take special precautions to prevent damage to building walls during hoisting of materials, equipment, etc. Provide substantial wood boxing over finished sheet metal coping or parapet flashings, stone or precast copings and similar items.
- D. Provide wood boxing for full height of door frame jambs for doors in exterior walls where opening will be used for passage of materials, equipment or access of personnel. Secure boxing in place by ties or screws into adjacent construction but which will not permanently mar finished surfaces. Provide wood boxing for full height of jambs of all window openings which are used for passage of materials or equipment, secured as noted above at doors.
- E. Provide flameproof tarpaulins or other acceptable fire-resistant materials to cover and protect full height and affected width of finished walls at hoisting locations. Contractor shall be responsible for all costs resulting from damage caused by failure to comply with this provision.

## **PART 3 EXECUTION – NOT USED**

### **END OF SECTION 01 5000**

## EDA PROJECT SIGN

The Contractor shall supply, erect, and maintain in good condition a project sign according to the specifications set forth below:

### EDA SITE SIGN SPECIFICATIONS

Size: 4' x 8' x ¾"

Materials: Exterior grade/MDO plywood (APA rating A-B)

Supports: 4" x 4" x 12' posts with 2" x 4" cross branching

Erection: Posts shall be set a minimum of three feet deep in concrete footings that are at least 12" in diameter.

Paint: Outdoor enamel

Colors: Jet Black, Blue (PMS300), and Gold (PMS7406). Specifically, on white background the following will be placed:

The U. S. Department of Commerce seal in blue, black, and gold;

“EDA” in blue;

“U. S. DEPARTMENT OF COMMERCE ECONOMIC DEVELOPMENT

ADMINISTRATION” in black;

“In partnership with” in blue;

(Actual name of the) “EDA Grant Recipient” in black;

Lettering: Specific fonts are named below; positioning will be as shown on the attached illustration.

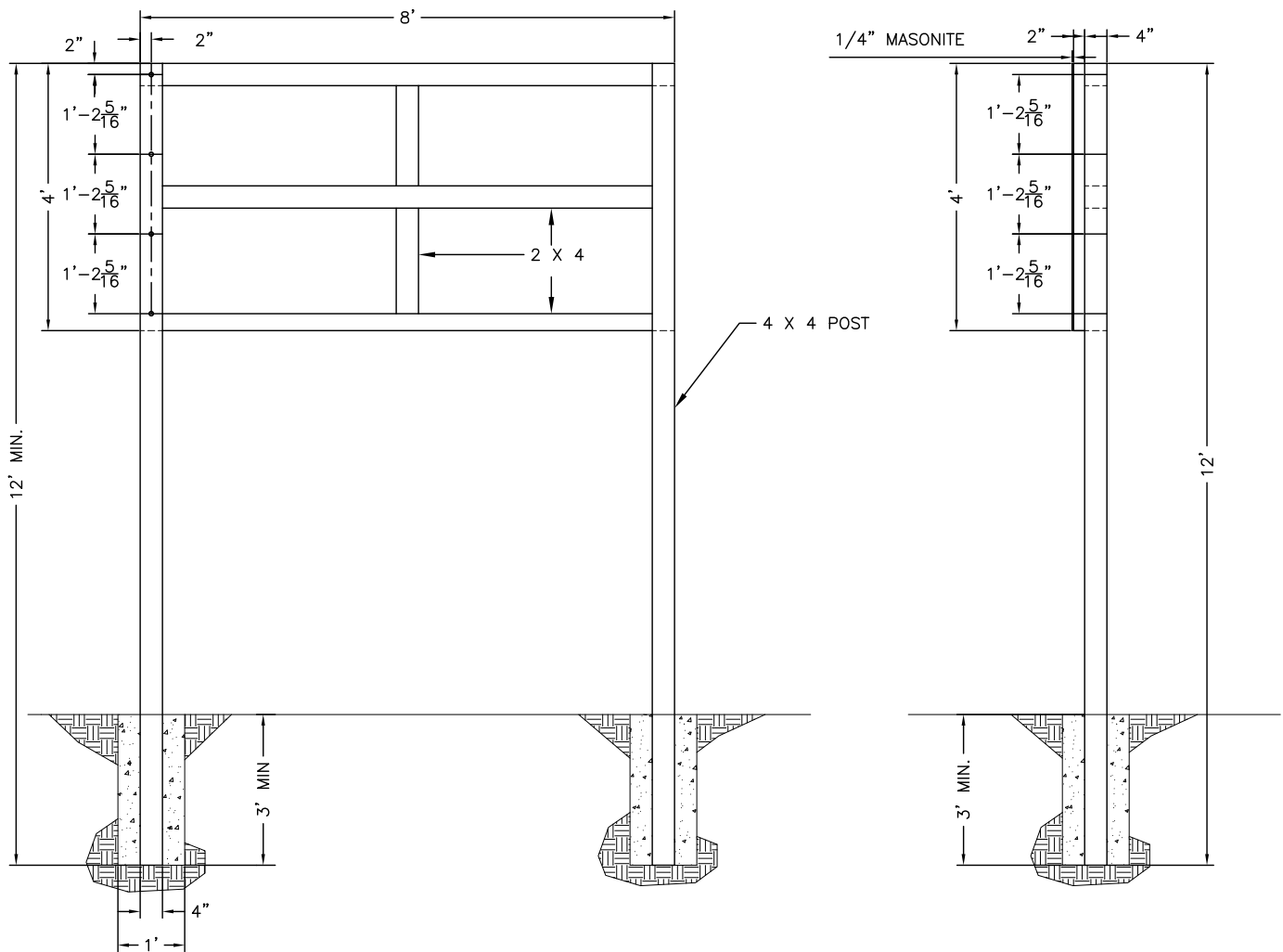
“U. S. DEPARTMENT OF COMMERCE ECONOMIC DEVELOPMENT  
ADMINISTRATION” use Bank Gothic Medium - **BANK GOTHIC MED**

“In partnership with” use Univers<sup>TM</sup> 55 Oblique - **Univers 55**

(Name of) “EDA Grant Recipient” use Univers<sup>TM</sup> Extra Black 85 **Univers 85**

Project signs will not be erected on public highway rights-of-way. If any possibility exists for obstruction to traffic line of sight, the location and height of the sign will be coordinated with the agency responsible for highway or street safety in the area.

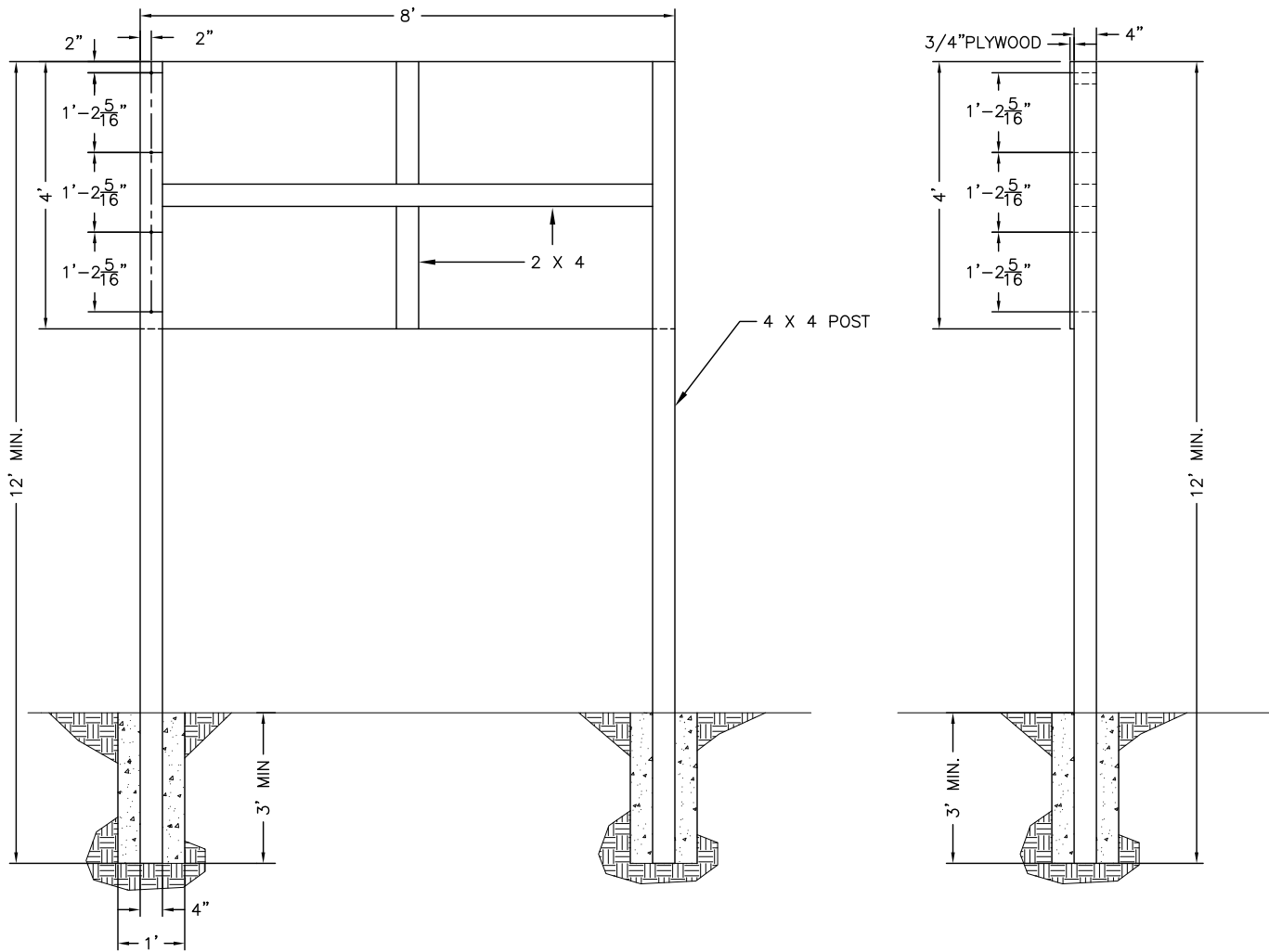
The EDA Regional Director may permit modifications to these specifications if they conflict with state law or local ordinances.



SIGN A  
MASONITE SIGN  
SCALE: 3/8" = 1'

PROJECT – SIGN A

ECONOMIC DEVELOPMENT ADMINISTRATION



SIGN B  
PLYWOOD SIGN  
SCALE: 3/8" = 1'

PROJECT - SIGN B

ECONOMIC DEVELOPMENT ADMINISTRATION



# EDA

U.S. DEPARTMENT OF COMMERCE ECONOMIC DEVELOPMENT ADMINISTRATION

*In partnership with*

**<EDA Grant Recipient Name>**





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## **SECTION 01 7329 - CUTTING AND PATCHING**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Administrative and procedural requirements for cutting and patching.

#### **1.03 SUBMITTALS**

- A. Cutting and Patching Proposal: Submit a proposal describing cutting and patching procedures well in advance of time cutting and patching will be performed and request approval to proceed when the following conditions are involved.
  - 1. Structural integrity of any element of the Project.
  - 2. Integrity of weather exposed or moisture sensitive element.
  - 3. Efficiency, maintenance, or safety of any operational element.
  - 4. Visual qualities of sight exposed elements.
  - 5. Work of Owner or separate contractor.
- B. Cutting and patching proposal shall include the following information, as applicable, in the proposal:
  - 1. Identification of Project.
  - 2. Location and description of affected work.
  - 3. Reason for cutting, patching, and/or alteration requirement and anticipated results in terms of changes to existing construction. Include in the building's appearance and other significant visual elements.
  - 4. Alternatives to cutting, patching, and/or alteration requirement.
  - 5. Effect on work by Owner or separate contractor.
  - 6. Written permission of affected separate contractors.
  - 7. Date and time work will be executed.
  - 8. Products to be used and firms or entities that will perform the work.
  - 9. Utilities that will be disturbed or affected. Indicate how long service will be disrupted.
  - 10. Where cutting and patching involves reinforcement of structural elements, furnish details and engineering calculations to show reinforcement is integrated with original structure.
  - 11. Approval by Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the work found to be unsatisfactory.

#### **1.04 QUALITY ASSURANCE**

- A. Requirements for Structural Work: Do not cut and patch structural elements in manner that would reduce their load-carrying capacity or load-deflection ratio.
- B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in manner that would result in reducing their capacity to perform as intended, or result in increased maintenance or result in decreased operational life or safety.
- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in manner that would, in the Architect's opinion, reduce the building's aesthetic qualities or result in visual evidence of cutting and patching.
  - 1. Remove and replace work cut and patched in a visually unsatisfactory manner.

#### **1.05 WARRANTY**

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Use materials identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding if unsafe or unsatisfactory conditions are encountered.
  - 1. Meet at Project Site with parties involved in cutting and patching before proceeding, including mechanical and electrical subcontractors. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
  - 2. Start of cutting and patching work will be construed as Contractor's acceptance of conditions within a particular area.

### **3.02 PREPARATION**

- A. Temporary Support: Provide temporary support of work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
  - 1. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
  - 2. Avoid cutting existing pipe, conduit or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

### **3.03 CUTTING AND PATCHING**

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
  - 1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent cutting and patching required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction using methods least likely to damage adjoining construction being retained.
  - 1. In general where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. To avoid marring existing finished surfaces cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
    - a. Pneumatic tools are not allowed.
    - b. Do not pound or make openings with hammers.
  - 4. By-pass utility services such as pipe or conduit before cutting where services are shown or required to be removed, relocated or abandoned.
    - a. Cut off pipe or conduit in walls or partitions to be removed.
    - b. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
  - 1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

2. Restore finishes of patched areas and extend finish restoration into retained adjoining construction in manner to eliminate evidence of patching and refinishing.
3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces to provide an even surface of uniform color and appearance. Remove existing floor and wall finish materials and replace with new materials, if necessary, to achieve uniform color and appearance.
  - a. Where patching occurs in a smooth painted surface extend final paint coat over entire unbroken area containing the patch to the nearest control joint or change in plane whichever is greater.
4. Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through the work.
5. At penetrations of fire-rated walls, partitions, ceilings, or floor construction, completely seal voids with UL rated firestopping systems to restore integrity of fire-rated element. Provide escutcheon plates where exposed to view.
6. Patch spray-applied fireproofing to restore integrity of fire-rated elements at locations where fireproofing has been removed during demolition and/or for attachment of new construction.

### **3.04 CLEANING**

- A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Completely remove paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

### **END OF SECTION**

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## **SECTION 01 7700 - CLOSEOUT PROCEDURES**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Administrative and procedural requirements for project closeout.

#### **1.03 SUBSTANTIAL COMPLETION**

- A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following, listing exceptions in the request:
  - 1. In the Application for Payment that coincides with, or first follows the date Substantial Completion claimed, show 100 percent completion for the portion of Work claimed as substantially complete. Include supporting documentation for completion as required and a statement showing an accounting of change to the Contract Sum. Comply with requirements of the General Conditions.
    - a. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction and reasons the Work is not complete.
  - 2. Advise Owner of pending insurance changeover requirements.
  - 3. Submit specified warranties, maintenance agreements, final certifications and similar documents as required by the General Conditions.
  - 4. Obtain and submit releases enabling Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.
  - 5. Submit record documents including maintenance manuals, damage or settlement survey, property survey and similar final record information.
  - 6. Deliver tools, spare parts, extra stock and similar items to Owner.
  - 7. Make final changeover of permanent locks and transmit keys to Owner. Advise Owner's personnel of changeover in security provisions.
  - 8. Complete start-up testing of systems and instruction of Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from site, along with construction tools, mockups and similar elements.
  - 9. Complete final cleaning requirements including touch-up painting.
- B. Inspection Procedures: On receipt of a request for inspection, Architect will either proceed with inspection or advise General Contractor of unfilled requirements. Architect will prepare the Certificate of Substantial Completion following inspection, or advise General Contractor of construction that must be completed or corrected before the certificate will be issued.
  - 1. Architect will repeat inspection when requested and assured the Work has been substantially completed.
  - 2. Results of the completed inspection will form the basis of requirements for final acceptance.
- C. Operating and Maintenance Procedures:
  - 1. Operating instructions shall include necessary printed directions for correct operation, adjustment, servicing, and maintenance of movable parts. Operating instructions shall include complete integration of new systems with existing systems and how they are to operate together, in series, sequence, etc. Also, include a suitable parts list, approved shop drawings, and diagrams showing parts location and assembly.
  - 2. Arrange for each installer of equipment requiring regular maintenance to meet with Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:
    - a. Maintenance manuals.
    - b. Record documents.

- c. Spare parts and materials.
- d. Tools.
- e. Lubricants.
- f. Fuels.
- g. Identification systems.
- h. Control sequences.
- i. Hazards.
- j. Cleaning.
- k. Warranties and bonds.
- l. Maintenance agreements and similar continuing commitments.
- 3. As part of instruction for operating equipment, demonstrate the following procedures:
  - a. Start-up.
  - b. Shutdown.
  - c. Emergency operations.
  - d. Noise and vibration adjustments.
  - e. Safety procedures.
  - f. Economy and efficiency adjustments.
  - g. Effective energy utilization.
- D. Upon Architect's approval and prior to issuance of final payments, submit 3 correct and complete copies of maintenance manuals.

#### **1.04 FINAL REVIEW**

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following, listing exceptions in request:
  - 1. Submit final payment request with releases and supporting documentation not previously submitted and accepted. Comply with requirements of the General Conditions. Include certificates of insurance for products and completed operations.
  - 2. Submit an updated final statement, accounting for final additional changes to Contract Sum.
  - 3. Submit a certified copy of Architect's final inspection list of items to be completed or corrected, stating each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by Architect.
  - 4. Submit record drawings and similar final record documents.
    - a. Each drawing shall be labeled "Project Record", dated and signed by the Contractor.
    - b. Each project record document shall be labeled "Project Record Document".
  - 5. Submit consent of surety to final payment.
  - 6. Submit evidence of final continuing insurance coverage complying with insurance requirements.
- B. Re-inspection Procedure: Architect will re-inspect Work upon receipt of notice the Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to Architect.
  - 1. Upon completion of reinspection, Architect will prepare Certificate of Final Acceptance, or advise Contractor of incomplete Work or of obligations not been fulfilled but required for final acceptance.
  - 2. If necessary, reinspection will be repeated for final acceptance.

#### **PART 2 PRODUCTS (NOT APPLICABLE)**

#### **PART 3 EXECUTION (NOT APPLICABLE)**

#### **END OF SECTION**



## **SECTION 02 4119 - SELECTIVE STRUCTURE DEMOLITION**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Selective structure demolition work includes, but is not limited to, the following:
  - 1. Demolition and removal of selected portions of the existing building.
  - 2. Patching and repairs.

#### **1.03 RELATED SECTIONS**

- A. Section 01 7329 - Cutting and Patching.
- B. Section 01 7700 - Closeout Procedures

#### **1.04 REFERENCES**

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations 2022, with Errata (2021).

#### **1.05 SUBMITTALS**

- A. Schedule: Submit schedule indicating proposed methods and sequence of operations for selective structure demolition work to Owner's Representative for review prior to commencement of work.
  - 1. Provide detailed sequence of demolition and removal work to ensure uninterrupted occupancy of building.
  - 2. Include coordination for shut-off of utilities, if required.
  - 3. Proposed dust-control and noise-control measures.
- B. Inventory of items to be removed and salvaged.
- C. Inventory of items to be removed by Owner.
- D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating all refrigerant that was present was recovered and recovery was performed according to EPA regulations.
  - 1. Include name and address of technician and date refrigerant was recovered.
- E. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction that might be misconstrued as damage caused by selective structure demolition operations.
- F. Landfill records indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous waste.

#### **1.06 QUALITY ASSURANCE**

- A. Contractor Qualifications: Engage only subcontractors who can demonstrate not less than five years successful experience in work of similar character.
- B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with NFPA 241.

#### **1.07 PROJECT CONDITIONS**

- A. Occupancy: The Owner will be continuously occupying spaces immediately adjacent to areas of selective structure demolition. Conduct selective structure demolition work in such manner that will minimize need for disruption of normal operations.

- B. Condition of Structures: Owner assumes no responsibility for actual condition of items to be demolished.
- C. Asbestos is NOT expected to be encountered in the course of this Contract. If any materials suspected of containing asbestos are encountered, do not disturb the materials. Immediately notify the Architect and the Owner.
  - 1. Asbestos will be removed by Owner before start of Work.
- D. Partial Demolition: Items indicated to be removed, but of salvable value shall be turned over to the Owner.
- E. Storage or sale of removed items or materials on-site is prohibited.
- F. Protections: Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective structure demolition work.
  - 1. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to and from the building.
  - 2. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.
  - 3. Protect floors with suitable coverings when necessary.
  - 4. Construct temporary insulated solid dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks if required.
    - a. Temporary dustproof partitions shall be fire-rated where indicated or required by authorities having jurisdiction.
  - 5. Remove protections at completion of work.
- G. Damages: Promptly repair damages caused to adjacent facilities by structure demolition work at no cost to Owner.

## **1.08 SCHEDULING**

- A. Arrange selective structure demolition operations so as not to interfere with Owner's existing on-site operations.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. General: Except as otherwise indicated or approved by Architect, provide materials for selective demolition which will result in equal-or-better work than the work being cut-and-patched in terms of performance characteristics, including visual effect where applicable. Comply with the requirements, and use materials identical to original materials where feasible and where recognized that satisfactory results can be produced thereby.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Prior to commencement of selective structure demolition work, inspect areas in which work will be performed.
- B. When unanticipated mechanical, electrical, and structural elements are encountered, and conflict with intended design, investigate and measure the nature and extent of conflict. Promptly submit a report in writing to Architect.
- C. Survey condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective structure demolition operations.

### **3.02 UTILITY SERVICES**

- A. Maintain existing utilities indicated to remain in service and protect against damage during selective structure demolition operations.
  - 1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by the Owner or authorities having jurisdiction.

### **3.03 PREPARATION**

- A. Conduct structure demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective structure demolition area.
  - 1. Cover and protect equipment and fixtures from soiling or damage when demolition work is performed in rooms or areas from which such items have not been removed.
- B. Erect and maintain dustproof partitions and closures as required to prevent spread of dust or fumes to occupied portions of the building.
  - 1. Where selective demolition occurs, construct dustproof partitions of minimum 4 inch studs, 5/8 inch drywall (joints taped) on occupied side, 1/2 inch fire-retardant plywood on demolition side, and fill partitions cavity with sound-deadening insulation.
- C. Provide and maintain shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished.
- D. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior construction and new construction, to ensure no water leakage or damage occurs to structure or interior areas.

### **3.04 DEMOLITION**

- A. Demolish and remove existing construction only to extent required by new construction and indicated.
- B. Perform selective structure demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.
- C. Employ only skilled tradespeople to perform selective structure demolition.
- D. Cut work by methods least likely to damage work to be retained and work adjoining. Neatly cut openings and holes square, plumb, and true to size required.
- E. In general, where physical cutting action is required, cut work with sawing and grinding tools, not with hammering and chopping tools.
- F. 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 spaces before starting flame-cutting operations.
  - 1. Maintain portable fire-suppression devices during flame-cutting operations.
- G. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
- H. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power driven masonry saw or hand tools; do not use power driven impact tools.
- I. Removal of flooring materials shall include all adhesives, setting beds, underlayments, and other materials detrimental to new finished flooring materials.

### **3.05 PATCHING AND REPAIRS**

- A. Promptly patch and repair damaged surfaces caused to adjacent construction by selective structure demolition operations.
- B. Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.
- C. Restore exposed finishes of patched area; and where necessary, extend finish restoration onto retained work adjoining, in manner to eliminate evidence of patching.
- D. Closely match finish and texture of existing adjacent surfaces.
- E. Where selective structure demolition terminates at a surface, finish, or substrate to remain, completely remove all traces of material selectively demolished, including mortar beds. Provide smooth, even substrate transition.

- F. Where patching smooth painted surfaces, extend final coat of paint over entire unbroken surface, after patched and repaired area has received primer and second coat.

### **3.06 DISPOSAL OF DEMOLISHED MATERIALS**

- A. Remove debris, rubbish and other materials resulting from demolition operations from building site. Do not allow demolished materials to accumulate on-site. Transport and dispose of materials off-site in legal manner in an EPA-approved landfill.
  - 1. If hazardous materials are encountered during demolition operations, immediately stop work in the area affected and report the condition to the Owner and Architect in writing. If Owner determines the hazardous materials are asbestos or PCB's, do no further work in the area until the materials are either removed or rendered harmless, and the area has been certified safe by appropriate authorities.
  - 2. Burning of removed materials is not permitted on project site.

### **3.07 CLEAN-UP AND REPAIR**

- A. Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean.
- B. Repair demolition performed in excess of that required. Return surfaces to remain to condition existing prior to commencement of selective structure demolition work. Repair adjacent construction or surfaces soiled or damaged by selective structure demolition work.
- C. Clean adjacent portion of the structure and improvements of dust, dirt and debris caused by demolition operations, as directed by the Architect and Owner, or governing authorities. Return adjacent areas to conditions existing prior to start of work.

### **END OF SECTION**

## **SECTION 05 1200 - STRUCTURAL STEEL FRAMING**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.02 SUMMARY**

- A. Section Includes:
  - 1. Structural steel.
  - 2. Bolts, washers, and other steel accessories
  - 3. Shear studs.
  - 4. Welded steel connections.
- B. Related Sections:
  - 1. Division 05 Section "Metal Grating".

#### **1.03 DEFINITIONS**

- A. Structural Steel: Elements of structural-steel frame, as classified by American Institute of Steel Construction (AISC) 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Heavy Sections: Rolled and built-up sections as follows and subjected to special notch toughness, fabrication, welding and inspection requirements as defined in this specification:
  - 1. Shapes included in ASTM A6 with flanges thicker than 1-1/2 inches.
  - 2. Welded built-up members with plates thicker than 2 inches.
  - 3. Column base plates thicker than 2 inches.

#### **1.04 ACTION SUBMITTALS**

- A. General:
  - 1. Review of submittals if of a general nature only, and responsibility for conformance with the intent of the Contract Documents shall remain with the Contractor. Review does not imply nor state that fabricator has correctly interpreted the Contract Drawings.
  - 2. All submissions shall be in accordance with the submission schedule developed and agreed between the Architect and Contractor at the commencement of the project. Submission shall include dates of order and delivery of materials to the shop and the site.
  - 3. Shop drawing schedule shall allow adequate time for reviews. Submittal shall include all related pieces in an assembled or area. The Contractor shall allow adequate time in shop drawing preparation stage for the dimensioning process and coordination with the Architectural Drawings and those of other disciplines. Submit a schedule for steel shop and erection drawings.
- B. Product Data: For each type of product indicated.
- C. LEED Submittals:
  - 1. An alternative method of complying with Credit MR 4.1 and MR 4.2 requirements is to retain requirement in Division 01 Section "Sustainable Design Requirements" that gives Contractor the option and responsibility for determining how Credit MR 4.1 and MR 4.2 requirements will be met.

2. An alternative method of complying with Credit MR 5.1 and MR 5.2 requirements is to retain requirement in Division 01 Section "Sustainable Design Requirements" that gives Contractor the option and responsibility for determining how Credit MR 5.1 and MR 5.2 requirements will be met.
  3. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of post-industrial and post-consumer recycled content. Include statement indicating costs for each product having recycled content, materials cost only.
  4. Product Data for Credit MR 5.1 and Credit MR 5.2: For products and materials that meet or can contribute to the requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to project, cost for each regional material, and fraction by weight that is considered regional.
- D. Shop Drawings: Show fabrication of structural-steel components, including anchor rod setting plans, details of layout and connections, fabrication of all members, and element and erection plans. Direct copies of the Contract Documents are not acceptable as a submission from the Contractor.
1. Submit shop drawings to Architect for review and obtain Architect's acceptance prior to start of fabrication. Where shop drawings are resubmitted, the Contractor shall cloud and identify all changes made due to additions, deletions, and corrections to the shop drawing. Shop drawings resubmitted without each change being clouded and identified will be returned for resubmission.
  2. Only shop drawings marked "No Exceptions Taken" or "Make Corrections Noted, Resubmittal Not Required" may be used by the Contractor in the work. Shop drawings marked "Rejected" or "Revise and Resubmit, Not Accepted for Reasons Given" shall be corrected and completed as required and resubmitted and approved before they are used in the work.
  3. Include layout, member size, and weights, materials used, and beam marks as well as orientation and relation of members to appropriate grid lines and setting elevations for column bases. Reference shop drawings to specific location and detail number on the Structural Drawings.
  4. Include details of cuts, connections, splices, camber, holes, openings, doubler plates, stiffeners and other pertinent data, including bolt hole sizes, connection materials, and welded joint designations.
  5. Include embedment drawings.
  6. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Identify WPS applicable to each shop weld.
  7. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pre-tensioned and slip-critical high-strength bolted connections.
  8. Indicate surface preparation and finishes.
  9. Submit plans of all levels locating the edge of slab at perimeter and at interior openings.
  10. Where items such as anchor bolts and inserts are scheduled to be set into concrete or masonry provide setting drawings, templates, instructions and directions for their installation. Coordinate delivery with other work to avoid delay of job progress.
- E. Connection Design:
1. The Contractor is responsible for the design of connections when they are not fully defined on the Contract Documents.
  2. The Engineer shall be licensed in the state in which the project is located. At the commencement of the project submit a letter signed and sealed by the Engineer that will supervise the steel connection design attesting to this responsibility.

3. At the end of the steel shop drawing submission phase submit a letter, signed and sealed by the Engineer supervising the steel connection design, attesting to the completion of the work.
  4. Submit calculations of moment and braced frame connections. Calculations and details shall be clearly keyed to the appropriate members on the construction documents. Calculations shall bear the seal of the Engineer supervising design of the steel connections.
  5. When connection calculations are resubmitted, the Contractor shall cloud and identify all changes made due to additions, deletions, and corrections to the calculation. Calculations will be returned as "Not Reviewed" if changes are not identified.
  6. Contractor shall not proceed with steel erection until these requirements are fulfilled.
  7. The Contractor shall not submit any piece drawing for review until all connections used on that drawing have been reviewed by the Engineer. Drawings submitted with connections that have not previously been submitted for review will be rejected as incomplete.
- F. Erection Procedures:
1. Submit procedures, methods, sequences of erection, temporary shoring and guying, and equipment proposed for erecting structural steel. Erection procedures are submitted for record only and therefore will not be returned to the Contractor.
- G. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including items listed below. All submitted Procedures shall be reviewed by the Testing Agency prior to use on the project for conformance with the requirements of AWS D1.1. The Procedures will be submitted to the Engineer for record only.
1. Power source (constant current or constant voltage).
  2. Electrode and flux manufacturer and trade name.
  3. Tolerances or the acceptable range of values, applicable to the various welding parameters.
  4. Where backgouging is required provide back gouging criteria (e.g. smoothness, grinding, gouge shape, inspection by the welder, etc.).
  5. For multi-pass welds define sequence and layering of passes.
  6. Welding Procedure Qualification Record (WPQR) Tests: For WPSs that are not pre-qualified per AWS D1.1, submit the supporting WPQR tests results conducted in accordance with AWS D1.1 along with the corresponding WPS.
  7. When the required effective throat thickness of flare groove welds is larger than allowed by Table J2.2 of AISC "Steel Construction Manual", submit data establishing by qualification the consistent production of such larger effective throat thickness. Qualification of effective throat thickness shall be as required by the AISC specification.
  8. For complete penetration butt or groove welds, include test records for the following only at locations specified on the drawings: toughness, (Charpy tests for weld metal), heat affected zone.
  9. In addition to the WPS submit fabrication and erection procedures where needed to control shrinkage, fabrication tolerances, or to insure proper inspection.
- H. Weld Shrinkage and Distortion Procedures: Submit weld shrinkage and distortion procedures for all welded connections where distortion due to weld shrinkage may cause damage to the steel material. The welding sequence and procedures are to minimize the effect of weld shrinkage, residual stresses, and to maintain erection tolerances. These procedures shall be reviewed by Testing Agency, and then used by Testing Agency to verify conformance. As a minimum, procedures shall be submitted for the following connections:
1. Welding of continuity plates and doubler plates into the WF columns.

2. Field welding and bolting of special-moment-frame beam-to-column connection (include beam flange welds, rib welds, connection plate bolting and weld).
  3. Welding ASTM A913 columns to base plates.
- I. Fastener Installation Procedures: Submit written procedures for the pre-installation testing, installation snugging, pre-tensioning, and post-installation inspection of fasteners. The procedures shall meet all requirements of the Research Council on Structural Connections (RCSC) "Specification for Structural Joints Using ASTM A325 or A490 Bolts" and the Contract Documents.

#### **1.05 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified Installer, fabricator, professional engineer, and testing agency.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties, regardless of thickness or use. Reports shall comply with ASTM A6.
1. Submit a mill report for each heat of steel used, and certified fastener reports for all fasteners, including nuts, washers and direct tension indicators prior to the start of fabrication. For unsatisfactory mill test report, retest steel.
  2. Include Charpy test results for heavy sections and for materials where Charpy values are specified. Testing required per AISC Section A3.1c for sections with over 2" flanges with net tension and have CJP welds.
  3. Mill test reports shall include ladle analysis and tensile elongation and bend tests.
  4. Mill reports shall be traceable to individual pieces of steel used.
- E. Contractor Certificate of Compliance for Materials: Submit a Certificate of Compliance letter stating that the Contractor has reviewed the submitted manufacturer's test reports and certifications, and that the materials being furnished for the project are in conformance with the applicable standards and project documents. The Certificate of Compliance letter shall be submitted along with the manufacturer's test reports and certifications for structural steel, fasteners, welding filler metals, and shear studs.
- F. Product Test Reports and Certifications: Submit manufacturer's test reports and certifications as listed below. Test Reports and Certifications are submitted for record only and therefore will not be returned to the Contractor. A copy of the test reports and certifications shall be sent to the owner's Quality Assurance Agency. The Contractor Certificate of Compliance letter shall accompany the Manufacturer's Certifications.
1. Bolts, nuts, and washers including mechanical properties and chemical analysis. Certifications for high strength bolts shall conform to certification requirements contained in ASTM A325, A490, F1852, F959, F2280.
  2. Tension-control, high-strength bolt-nut-washer assemblies.
  3. Shop primers.
  4. Welding electrodes, fluxes and shielded gas products. Certifications shall satisfy the applicable AWS A5 and project requirements.
- G. Source quality-control reports.
- H. Field quality control and special inspection reports
- I. Survey of existing conditions



- J. Submit fabricators identification mark system to Testing Agency prior to fabrication.
- K. QUALITY CONTROL AND QUALITY ASSURANCE
- L. Comply with AISC Chapter N minimum quality control and quality assurance requirements.
- M. Testing Agency: Shop and field testing and inspection of steelwork specified in this document or requested by the Owner will be performed by an independent agency engaged by the Owner.
  - 1. The Testing Agency shall be furnished with the following:
    - a. One complete set of fabrication and erection drawings.
    - b. Material bills, cutting lists, order sheets and mill test reports.
    - c. Information regarding time, place of rolling and shipment of materials to shop.
    - d. If requested, representative sample pieces for testing.
    - e. Full and ample means and assistance for testing materials.
    - f. Access and facilities, including scaffolding, temporary work platforms, etc., for testing and inspection at all places where materials or components are stored, fabricated or erected in the mill, shop or field.
    - g. Complete set of welding procedures.
    - h. Welder qualifications.
    - i. AISC fabricator certification documents, QA/QC manual and most recent AISC audit.
    - j. Reports for all Contractor tests and inspections.
  - 2. In addition to the work specified elsewhere in the Contract Documents, the Testing Agency shall review the following for compliance with project specifications:
    - a. Fastener Installation Procedures.
    - b. WPSs and WPQRs.
    - c. Manufacturer's Test Reports and Certifications.
    - d. Welder qualification.
- N. Comply with applicable provisions of the current edition of the following specifications and documents, except where more stringent requirements are shown or specified:
  - 1. AISC 303 "Code of Standard Practice for Structural Steel Buildings and Bridges".
  - 2. AISC 360, "Specification for Structural Steel Buildings".
  - 3. AISC "Steel Construction Manual".
  - 4. RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts." with supplements.
  - 5. American Welding Society (AWS) D1.1.
  - 6. Local Building Code, as applicable
- O. All work shall be performed by qualified operators experienced in their field of work and as otherwise required by these specifications.
- P. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172)]. The fabricator shall have a minimum of 5 years experience in similar types of fabrication. Fabricator shall be able to furnish evidence of ability, facilities, proficiency of personnel, and completed projects with similar structural systems.
- Q. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE. The erector shall have a minimum of 5 years experience in similar types of erection. Erector

shall be able to furnish evidence of ability, facilities, proficiency of personnel, and completed projects with similar structural systems.

- R. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- S. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1 for each process, position and joint configuration. Each operator shall have been qualified as prescribed by AWS and shall be approved by the Ann Arbor building department. Qualification performed more than six months prior to the start of the welding by the welder is acceptable, provided written documentation is submitted showing that the welder has continued to use the applicable welding process on an ongoing basis since the test was conducted, with no lapse in service exceeding six months.
  - 1. Welder Certificates shall be submitted to Testing Agency prior to welding.
  - 2. Require welders to retake the qualification test if, as determined by the Architect or Testing Agency, there is a reasonable doubt as to the proficiency of the welder. If the welder does not requalify, he shall not perform any welding on the project.
  - 3. In addition to AWS D1.1 requirements on welder Qualification, qualify welders making welds with restricted access (such as welding the bottom flanges of girders to column flanges through cope or access holes in the girder webs) by using a mock-up assembly identical to the actual conditions of producing weldments in the field, using the approved WPS.
  - 4. Welder qualification shall include passing the bend test [and Charpy tests when Charpy values are specified for the electrode].
- T. Quality Control Inspector Qualifications: Along with Quality Control Plan, Contractor shall submit written qualifications for all inspectors to be assigned Quality Control functions for structural steel work, including general inspection, bolting inspection, welding inspection, and non-destructive testing. Qualifications for welding inspectors shall show evidence of ability to monitor all WPS variables, check weld sizes, and visually detect weld defects.
- U. Unidentifiable Materials: Materials delivered with certificates are classified as identifiable; those without certificates are classified as unidentifiable.
  - 1. Testing of Unidentifiable Material: By Contractor's testing agency; paid for by Contractor.
    - a. General: Test material not identifiable by heat number and mill test or other acceptable manufacturer's identification per ASTM A370 as follows.
    - b. Shear Studs: Each lot of 100 studs; tensile tests on 3 finished studs per AWS.
    - c. Structural Shapes and Plates: From coupons taken from material; one tensile test and one bend test per 5 tons of each shape.
    - d. High Strength Bolts: Each lot of 100 bolts; tensile tests on 2 bolts in full size and one tensile test on a 1/2" diameter machined specimen.
    - e. Other Materials: Test as directed.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Do not handle structural steelwork until paint has thoroughly dried. Care shall be exercised to avoid abrasions and other damage.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration. Material shall be kept free from dirt, grease, and other foreign matter.
  - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged

materials or structures as directed, to the acceptance of the Architect, and at no additional cost to the Owner. Materials showing evidence of damage will be rejected and shall be immediately removed from the site.

- C. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
  - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
  - 2. Clean and re-lubricate bolts and nuts that become dry or rusty before use.
  - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F1852 fasteners and for retesting fasteners after lubrication.
- D. Requirements for storage and handling of electrodes shall be per AWS D1.1. Additional requirements include:
  - 1. Long term storage of weld consumables shall be indoors, where moisture or dew does not collect, and in undamaged manufacturer's shipping bags, boxes, and containers.
  - 2. Open Flux Cored Arc Welding (FCAW) electrodes shall be completely covered during hours of non-use (i.e., weekends, nights of nonuse, days of nonuse, etc.). Where rain or dew could be expected to collect (i.e., open floors of erection site, open shop bays, etc.), electrodes shall also be covered.

## **1.07 COORDINATION**

- A. Surveys: Contractor shall conduct field surveys and field verification as required to incorporate existing conditions from previous works, such as foundations and existing buildings, to the work before shop drawings are produced.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions for installation.
- C. Notify the Owner's Representative in sufficient time prior to shop or field fabrication or erection to permit testing and inspection without delaying work.
- D. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

## **1.08 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site Prior to performing fabrication or erection work, there shall be a pre-fabrication and pre-erection meeting to review welding procedures, bolting procedures, and inspection requirements for all welding and bolting operations. The meeting shall include the following individuals: Owner's Representative, Testing Agency, Special Inspector, Steel Fabricator, Erector personnel supervising the shop, field and quality control work.

## **PART 2 - PRODUCTS**

### **2.01 STRUCTURAL STEEL MATERIALS**

- A. W-Shapes: ASTM A992, typical, and ASTM A572, Grade 50 as noted on Contract Drawings
- B. Channels, Angles, M, S-Shapes: ASTM A36.

- C. Plate and Bar: ASTM A36.
- D. Cold-Formed Hollow Structural Sections: ASTM A500, Grade B, welded structural tubing.

## **2.02 WELDING MATERIALS**

- A. Welding Material: Filler metal requirements shall conform to AWS D1.1 and AISC "Specification for Structural Steel Buildings". Minimum classified tensile strength of 70 ksi (E70). Use low hydrogen electrodes as defined by AWS D1.1, unless noted otherwise. For all CJP welds used on Heavy Structural Sections that are not part of the Seismic Load Resisting System the filler metal shall have a Charpy V-Notch (CVN) toughness of at least 20 ft-lb at 70 degrees F.

## **2.03 BOLTS, CONNECTORS, AND ANCHORS**

- A. High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1 or Type 3, heavy-hex steel structural bolts unless noted otherwise; ASTM A563, Grade C, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers; all with plain finish. ASTM F1852 Twist-Off Type Torque Control Bolts are a suitable alternative to ASTM A325 bolts, although use of such bolts shall not negate the requirement that Direct Tension Indicators be used for inspection.
  - 1. Direct-Tension Indicators: ASTM F959, Type 325, compressible-washer type with plain finish. Use where noted 'slip-critical' or 'fully pre-tensioned' on Structural Drawings.
- B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers.
  - 1. Finish: Hot-dip or mechanically deposited zinc coating.
  - 2. Direct-Tension Indicators: ASTM F959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.
- C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1 or Type 3, heavy-hex or round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
- D. Threaded Rods: ASTM A 36.
  - 1. Nuts: ASTM A563 heavy-hex carbon steel.
  - 2. Washers: ASTM F436, Type 1, hardened carbon steel.
  - 3. Finish: Plain or Hot-dip zinc coating, ASTM A153, Class C, where noted on drawings

## **2.04 PRIMER**

- A. Comply with Division 09 Section "Paintings and Coatings" and "High-Performance Coatings".
- B. Primer Paint shall comply with all applicable SSPC requirements and shall be compatible with finish paints and spray-on fireproofing specified elsewhere.
- C. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.
- D. Primer:
  - 1. Typical Interior Primer: SSPC-Paint 25, Type II. Primer shall comply with the requirements called out in the "Green Seal Standard for Anti-Corrosive Paints" (GC-03).

## **2.05 CONNECTION DESIGN**

- A. Include A-C of Connection Design section only if done by Contractor
- B. Contractor shall design all steel connections not fully defined in the Contract Documents. Design shall be performed by a qualified professional engineer.
- C. Type of Connections
  - 1. All connections shall be one of the following:
    - a. High-strength bolts assemblies.
    - b. Unfinished bolts assemblies.
    - c. Welds.
  - 2. When the type of connection is shown on the Drawings use that type of connection unless otherwise approved in writing by the Engineer of Record.
  - 3. Use a connection other than unfinished bolts where required by code and in the following locations:
    - a. All beam and column connections and splices unless otherwise noted on Drawings.
    - b. All connections indicated as such.
    - c. Connections that are a part of the lateral force resisting system.
    - d. Connections for supports of running machinery or of other live loads which produce impact.
    - e. Connections carrying cooling tower loads.
    - f. Beams supporting columns or posts.
    - g. Connections for cantilevers.
    - h. Full and partial moment connections.
- D. Design Criteria.
  - 1. Design connections for the loads and according to the requirements in the Contract Documents and the applicable building regulations.
  - 2. Bolts shall be at least  $\frac{3}{4}$  inches in diameter.

## **2.06 FABRICATION**

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303 and AISC 360.
  - 1. Camber structural-steel members where indicated. Fabricate beams and girders with natural camber upward, unless noted otherwise on the drawings. Camber stated in the drawings is the required camber after erection.
  - 2. Fabricate beams with rolling camber up.
  - 3. Identify high-strength structural steel according to ASTM A6 and maintain markings until structural steel has been erected.
  - 4. Mark and match-mark materials for field assembly. Members shall be fabricated for delivery in a sequence that will expedite erection and minimize field handling of structural steel.
  - 5. Splice members only where indicated on Structural Drawings or where accepted by the Architect.
  - 6. All hollow members exposed to weather shall be sealed with continuous welds, incorporating structural welds where shown or required.
  - 7. Grind burrs, sharp arrises and ragged edges that would prevent solid seating of the connected parts.
  - 8. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Tolerances:

1. Except as noted as follows, maintain fabrication tolerances of structural steel within the tolerances specified on the drawings and AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible. An unguided torch may be used provided the cut is within 1/8 inch of the required line.
  1. Plane thermally cut edges to comply with requirements in AWS D1.1.
- D. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.
  1. Use standard holes unless otherwise indicated as oversized, short-slotted, or long-slotted on the Drawings. Holes shall be drilled or punched at right angles to the surface of the metal. Making or enlarging holes by burning is prohibited.
  2. Flame cut holes for fasteners are not acceptable.
  3. Holes in column baseplates shall be no more than **[3/8-] [1/2-]** inch larger than the nominal bolt size. Holes in column baseplates shall be within the limits of table 14-2 of AISC "Steel Construction Manual"
  4. For the following conditions holes shall be drilled (not punched), even where punching is allowed by referenced standards: a) material having a thickness in excess of 7/8 inch or the hole diameter; b) column base plates; c) holes less than 6-inches from an edge that requires a CJP weld; d) where holes are subjected to welding shrinkage stresses.
- E. Bending Steel Plate:
  1. Bend plates perpendicular to the rolling direction.
  2. Grind flame cut plate edges transverse to the bend line.
  3. Grind out nicks in plate edges transverse to the bend line.
  4. Round sharp corners on plate edges transverse to the bend line.
- F. Heat Straightening: Will be permissible by the use of properly controlled heat, skilled personnel, proper equipment and in accordance with documents prepared by the fabricator and accepted. Reject materials that contain kinks or sharp angles. Material straightened prior to fabrication shall be rejected where it shows signs of distress or defects.
- G. Planing and Milling: Accurately finish ends of columns and other members transmitting bearing loads. Mill bearing surfaces to true planes. Mill ends of columns perpendicular to centerline axis connection mid-depth points at ends of member. Cut and fit column and bearing stiffeners in manner to provide bearing over entire cross section
  1. Column Base Plates
    - a. From 2" Through 4" Thickness: Straighten by pressing.
    - b. Over 4" Thickness: Plane top for column bearing; plane bottom when bearing on steel.
- H. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning" and SSPC-SP 2, "Hand Tool Cleaning."
- I. Shear Studs: Prepare steel surfaces as recommended by manufacturer of shear studs. Use automatic end welding of headed-stud shear studs according to AWS D1.1/D1.1M and manufacturer's written instructions.
- J. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
  1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
  3. Weld threaded nuts to framing and other specialty items indicated to receive other work.
- K. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.
- L. Welded Door Frames: Build up welded door frames attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated.
- M. The Contractor shall cooperate fully with requests from inspection and testing personnel for access to the connections and joints to be inspected and tested. This includes beam and column turning in shop, weld backing removal when nondestructive examination indicates rejectable conditions, and access to platforms or scaffolding as required to perform the work safely.
- N. Any technique not covered by this Section shall be submitted to the Engineer of Record for approval

## **2.07 SHOP CONNECTIONS**

- A. General Bolting:
1. Product containers must be marked with lot numbers and traceability information so that correspondence with mill reports can be established. Manufacturer's symbol and grade markings shall appear on all bolts, nuts, through-hardened washers and direct tension indicators.
  2. Bolts shall be of a length that will extend to a point at least flush with the surface of the nuts, though not more than a length equal to the height of the nut, beyond the nuts unless otherwise noted.
  3. Bolts shall be installed with threads excluded from the shear plane.
  4. Washers shall be used on all bolts. Use beveled washers where bolts bear on sloping surface.
  5. Circular and slotted holes shall be as per Specification for Structural Joints Using ASTM A325 or A490 Bolts.
  6. Where bolt holes are subject to welding shrinkage stresses the holes shall be drilled.
- B. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for type of bolt and type of joint specified. Contact surfaces of bolted parts shall as a minimum comply with the Class A requirements.
1. Joint Type shall be as noted on drawings.
  2. Direct tension indicator (load indicating washers or "Tension-Set" bolts) method shall be used at slip-critical connections. "Turn-of-Nut" methods are not an acceptable alternative.
  3. When connection has bolts and welds, fully tighten bolts prior to welding with the exception that in moment connections the flange welds shall be completed prior to final tightening of high strength bolts.
  4. When already tensioned bolts have had their tension relaxed, replace the bolt and tension indicator and re-tighten.

- C. Unfinished Bolts (Machine Bolts): Machine bolts shall be brought to a snug tight condition. Mutilate bolt threads for unfinished bolts to prevent the nuts from backing off.
- D. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Shop welds shall be inspected in the shop before the work is painted or shipped.
  - 2. Weld sizes where shown shall be assumed to be effective weld sizes.
  - 3. All groove or butt welds shall be full penetration unless noted otherwise on the Drawings.
  - 4. Where structural steel members are to remain exposed in the finished work, welds exposed to view shall be uniformly made and ground smooth.
  - 5. Weld tabs shall be in accordance with AWS D1.1. In addition, weld tabs shall extend beyond the edge of the joint a distance equal to the plate thickness but not less than 1-inch except at access holes in beam/girder webs and at continuity plate clips. Weld tabs shall be oriented parallel to the joint preparation and to the weld direction. Weld dams are not allowed.
  - 6. Remove weld tabs and backup plates and grind surfaces smooth as required for inspection or testing. Where tabs or backup bars interfere with architectural treatment or are exposed to view in the final structure, remove and grind smooth. Backup bars and run-off tabs at Heavy Structural Sections shall be removed.
  - 7. Splices of members in tension, all members of moment frames and all members of braced frames that are made from heavy steel sections shall be made in conformance with Section J1.5 of AISC 360.
  - 8. Weld variables shall be consistent with the recommendations of the electrode manufacturer.
  - 9. Do not weld into column flange-to-web intersection as defined the AISC "k" and "k1" distances except for the doubler plate to column welds. Continuity plate welds shall stay clear of this area as noted on the drawings.
  - 10. Sequence the work as necessary to accommodate testing.
  - 11. Welding Procedures:
    - a. Weld only in accordance with the Welding Procedure Specifications. WPS shall be readily available to all welders, inspectors, and supervisors during the production process.
    - b. Consider toughness and notch sensitivity of steel in formation of the welding procedures to prevent brittle and premature fracture during fabrication and erection. Toughness requirements are to match those of the parent metal.
    - c. Weld in a manner to minimize accumulation and concentration of through-thickness strains due to weld shrinkage. Sequence welds in a manner to reduce residual stresses (caused by welding) to a minimum value. Welding procedures shall incorporate measures necessary to eliminate cracking.
    - d. Do not mix different electrodes in the same weld joint unless the interactions have been shown not to cause problems.
    - e. Stringer passes only, no weaving or wash passes. Manipulation of the electrode for vertical welds (oscillation) shall be kept to a maximum movement of 4 to 5 electrode diameters.
    - f. Welding shall not begin until joint elements are bolted or tacked in intimate contact and adjusted to dimensions shown in the Drawings, with proper allowance for any weld shrinkage.
    - g. All tack welds shall be of the same quality as final welds. Preheat of tack welds is only necessary at the immediate area where the tack is placed. Preheat temperature is the same as for welding. Tack welds must be placed where they will be consumed in the weld, or be ground out to a depth of 1/8" but not rewelded unless the gouge is greater than 1/8". If rewelding is necessary, it shall then be considered a new weld with all relevant weld inspections.
  - 12. Refer to the Structural Drawings for additional requirements.



## **2.08 SHOP PRIMING**

- A. Shop prime all steel surfaces exposed to weather or not completely concealed by interior finishes unless noted otherwise and excepting the following:
  - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
  - 2. Surfaces to be field welded and areas within 4 inches on each side of field welds.
  - 3. Top surfaces of beams to receive metal deck.
  - 4. Surfaces to be high-strength bolted except surfaces painted with Type B Primer. Areas with high-strength bolts exposed to the weather shall receive a primer coat compatible with slip-critical type connections.
  - 5. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
  - 6. Galvanized surfaces.
  - 7. Machined surfaces.
  - 8. Welded shear studs.
- B. Steel members not otherwise painted shall be painted when subjected to condensation from piping, are in shower or steam rooms, are exposed to chemical fumes or are exposed to other conditions of potentially aggressive corrosion
- C. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the applicable SSPC specification requirements for each primer. As a minimum, all surfaces shall be prepared according to the following specifications and standards:
  - 1. SSPC-SP 2, "Hand Tool Cleaning"
  - 2. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 2 mils for interior primer and 3 mils for exterior primer. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
  - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- E. All steel exposed to the weather in the final structure shall be galvanized.
- F. Use special care if steel is fabricated, cleaned, and painted in damp weather to remove moisture from mill scale cracks.

## **2.09 GALVANIZING**

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123 and to bolts, nuts, and washers according to ASTM A153. Galvanize all items noted on Drawings to be galvanized and fasteners that connect galvanized components, except that ASTM A490 bolts shall not be hot-dip galvanized.
  - 1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
  - 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.
  - 3. Roughen faying surfaces of slip-critical high-strength bolted connections to achieve Class C surface accordance with the RCSC Specifications.

## 2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Testing Agency to perform shop tests and inspections as defined by AWS, AISC and these specifications. Testing Agency shall summarize their finding in inspection and testing reports. Reports shall identify any findings that are not in compliance with requirements of the project specifications.
  - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. See Part 1 of this specification for additional testing and inspection requirements. As a minimum the inspector will make all tests and inspections as required by the Michigan Building Code, latest edition and the International Building Code, latest edition. Testing Agency will make all the tests and inspections indicated in the Contract Documents.
- C. Contractor shall correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
  - 1. Owner's Representative reserves right, at any time before final acceptance, to reject material not complying with requirements.
  - 2. Any tests that may be necessary to reconfirm any noncompliance of original work, and as may be necessary to show compliance of corrected work, shall be at Contractor's expense.
- D. Each person installing connections shall be assigned an identifying symbol or mark and all shop and field connections shall be so identified so that the Inspector can refer back to the person making the connection.
- E. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
  - 1. High Strength Bolted Connections: High strength bolts specified as Snug-Tight (ST) need not be inspected for bolt tension.
  - 2. High Strength Bolted Connections: For bolts specified as Pre-Tensioned or Slip-Critical, the special inspector shall observe the preinstallation testing and calibration procedures when such procedures are required by the installation method or by project plans or specifications; determine that all plies of connected materials have been drawn together and properly snugged and monitor the installation of bolts to verify that the selected procedure for installation is properly used to tighten bolts.
    - a. Periodic monitoring: Monitoring of bolt installation for pretensioning is permitted to be performed on a periodic basis (10% or a minimum of 2 bolts per connection) when using the turn-of-nut method with matchmarking techniques, the direct tension indicator method or the alternate design fastener (twist-off bolt) method.
    - b. Continuous monitoring: Monitoring of bolt installation for pretensioning using the calibrated wrench method or the turn-of-nut method without matchmarking shall be performed on a continuous basis.
  - 3. Direct Tension Indicators: Observe all Direct Tension Indicators to see if proper tightness was achieved.
  - 4. Standard Bolted Connections: Testing Agency shall inspect the installation of A307 bolts to verify that 10% of all bolts or a minimum of 2 bolts per connection are installed properly and tightened to a Snug-Tight (ST) condition.
- F. Welded Connections:
  - 1. Testing Agency shall be present during all welding operations. In addition to visual inspection, all shop-welded connections will be tested and inspected according to AWS D1.1 and this specification using the following inspection procedures:
    - a. Liquid Penetrant Inspection (PT): ASTM E165.

- b. Magnetic Particle Inspection (MT): ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    - c. Ultrasonic Inspection (UT): ASTM E164.
    - d. Radiographic Inspection (RT): ASTM E94.
  - 2. Visual Inspection of Welding: Testing Agency shall visually inspect all shop and field welding of structural steel accordance with the governing building code and AWS D1.1. Visual inspection of welds shall include but not be limited to the following:
    - a. Verify: Welding Procedure Specification (WPS) sheet has been provided and has been reviewed with each welder making the weld, welder qualification and identification, fit-up meets tolerances of WPS and mark joint prior to welding, welding consumables are per the Contract Documents and the WPS, amperage and voltage at the arc with hand-held meters, meters on welding equipment are functioning and accurate.
    - b. Observe preheat and interpass temperatures, weld pass sequence and size of weld bead.
    - c. Multi-pass shop and field welds shall be continuously inspected.
    - d. Visually inspect welds of heavy structural sections, or plates of 1-1/2 inch minimum thickness, at least 72 hours after completion of welding for the presence of cracks.
    - e. Visually inspect areas where backing bars and welds tabs are removed for conformance with the surface roughness criteria of the specifications.
    - f. Verify that the effective throat thickness of flare groove welds is consistently obtained when flush to bar or section. This verification shall be based on test sections where necessary.
  - 3. Nondestructive Testing Requirements: Testing Agency shall perform non-destructive testing of shop and field welding in accordance with the project specifications, governing building code, and AWS D1.1. Extent of non-destructive testing shall be as follows:
    - a. Complete Joint Penetration (CJP) welds: UT 100% CJP welds greater than 5/16-inch. MT 25% all CJP welds.
    - b. Partial Penetration Joint (PPJ) welds: UT 100% of PJP welds greater than 5/16-inch. UT 100% PJP in column splices.
    - c. Fillet Welds: Fillet welds of gusset plates to beams, columns and base plates - MT 10% of the following fillet welds and reduce to 5% if no significant cracks are found in the first 50 tested: a) gusset plate fillet welds to beam and columns; b) base plate fillet welds.
    - d. Column Web Material at Continuity Plate: MT the WF column webs 3-inches above and below the weld terminations at the first 50 continuity plates and doubler plates installed. Test shall be conducted when weld has cooled to ambient temperature. If no web cracks are found, then no more testing required. This test shall also be conducted for all locations where the Contractor has welded into the "no weld" zone shown on the Drawings for continuity plates.
    - e. Access holes at splices in Heavy Structural Sections – MT or PT 100%.
- G. In addition to visual inspection, shop-welded shear studs will be tested and inspected according to requirements in AWS D1.1 and the governing building code for stud welding and as follows:
  - 1. The type and capacity of the welding equipment shall be in accordance with the manufacturer's recommendations and shall be checked and approved.
  - 2. At the beginning of each day's work, a minimum of 2 test stud welds shall be made, with the equipment to be used, to metal which is the same as the actual work piece. The test studs shall be subjected to a 90-degree bend test by striking them with a heavy hammer. After the above test, the weld section shall not exhibit any tearing or cracking.

3. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
  4. Tests will be conducted on additional shear studs if weld fracture occurs on shear studs already tested, according to requirements in AWS D1.1.
- H. Inspection Records
1. The inspector will maintain a daily record of the work that has been inspected and its disposition. One copy of each report will be submitted to the Owner on a weekly basis. Test reports will be made on the form suggested in the AWS D1.1 "Structural Welding Code".
  2. Make systematic record of all shop welds, including:
    - a. Date of inspection.
    - b. Location and type of weld.
    - c. Identification marks of welders.
    - d. List of defective welds.
    - e. Manner of correction of defects.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
  1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Discrepancies: In the event of discrepancy, immediately notify the Owner's Representative in writing. Do not proceed with construction in the region of the discrepancy until all such discrepancies have been resolved.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.02 PREPARATION**

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
  1. The Contract Drawings indicate the completed structure. The Contractor is fully responsible for all temporary measures necessary for erection, except where specific sequences and requirements are specified on the Drawings.
- B. Furnish templates for exact locations of items to be embedded in concrete and any setting instructions required for installation

#### **3.03 ERECTION**

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360. Check plumbness after erection of each tier.
- B. Dimensions shown on drawings are based on an assumed design temperature of 70 degree F. Fabrication and erection procedures shall take into account the ambient temperature range at the time of the respective operations.

- C. Where erection requires performing work of fabrication on site, comply with the applicable standards of Part 2 of this Specification.
- D. Care shall be taken to protect work already installed from damages resulting from structural steel erection.
- E. Items installed before concrete is placed shall be properly braced to prevent distortion by pressure of concrete. Watch and maintain bracing during concrete operations.
- F. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates. Remove any templates used for the setting of anchor bolts.
  - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Weld plate washers to top of baseplate.
  - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. If used, do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
  - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- G. Maintain erection tolerances of structural steel within AISC 303.
- H. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
  - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- I. Splice members only where indicated.
- J. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1.
- K. Expansion Bolts:
  - 1. Install in accordance with the manufacturer's recommendations.
  - 2. Use washers on all bolts.
  - 3. Use care to avoid cutting or damaging reinforcing bars.
  - 4. When exposed to view in the final structure, bolts shall be of a length that will extend entirely through but not more than 1/4-inch beyond the nuts unless otherwise shown on the Drawings.
- L. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts. Where a hole is required to be enlarged by more than 3/32-inch ream to and use next larger bolt size.
- M. Shear Studs: Prepare steel surfaces as recommended by manufacturer of shear studs. Use automatic end welding of headed-stud shear studs according to AWS D1.1 and manufacturer's written instructions.
- N. Temporary Shoring and Bracing:
  - 1. The Contract Drawings indicate the completed structure. The Contractor is fully responsible for all temporary measures necessary for erection, except where specific

- sequences and requirements are specified on the Drawings. See the Drawings for erection sequence notes and minimum requirements.
2. Contractor is responsible for identifying need for temporary construction and for the design, installation and use of all temporary bracing and supports necessary to stabilize the framing until complete.
  3. Provide temporary works as necessary to erect the structure and achieve proper alignment as erection proceeds. In addition, provide temporary bracing and shoring to brace the incomplete structure against loads such as wind and seismic forces comparable in intensity to the design loads for the completed structure.
  4. Make all necessary provisions for temporary bracing and for completion of erection where structural members are temporarily left out for erection at a later time.

### **3.04 FIELD CONNECTIONS**

- A. Field connection requirements shall be as a minimum equal to those specified in Part 2 of this document.
- B. Erection bolts for welded connection shall be tightened securely and left in place, unless noted otherwise.
- C. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for type of bolt and type of joint specified.
  1. Joint Type: Snug tightened, Pretensioned, Slip critical.
- D. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
  2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.
  3. Weld in manner to prevent warping or distortion of finished product. Use jigs which will not restrain piece from moving during welding or cooling after welding. Sequence weld passes at a joint to prevent excessive heat build-up or cause shrinkage cracks to form.
  4. Auxiliary Member Connections and Temporary Welds shall be per AWS provided that preheating may be omitted on ASTM A36 steel for single pass fillet welds with low hydrogen electrodes under the following conditions: Air temperature is 60° F. or over, steel is dry, and welds to structural base material are more than 1" away from corners or ends of plates.
  5. Preheat and post-heat procedures for welded joints shall be utilized to prevent rapid cooling of welds, particularly in cold weather. Procedures are Contractor's responsibility.
- E. Shear Studs: The shear studs shall be automatically end welded in accordance with AWS D1.1 and the manufacturer's recommendations in such a manner as to provide complete fusion between the end of the stud and the plate.
  1. There should be no porosity or evidence of lack of fusion between the welded end of the stud and the plate.
  2. Shear studs through metal deck shall be welded through the deck within 1 day of laying the deck.
- F. Bearing Pads: Install bearing pads in accordance with manufacturer's recommendations.

### 3.05 FIELD QUALITY CONTROL

- A. Field quality control shall, as a minimum, conform to the requirements specified under Source Quality Control in Part 2.
- B. Erection Tolerances: Unless otherwise noted, level and plumb individual members of the structure within a tolerance of 1:500, but not to exceed 1/2" for full height of columns. Make exterior columns and columns adjacent to elevator beams accurate within tolerance of 1:1000, but not to exceed 1/2" for full column height. Make level and plumb based on the mean operating temperature of the structure, allowing for the difference in temperature at time of erection and the mean temperature of the structure when completed and in service. Base measurements relating to tolerances on the theoretical centerline of the columns.
  - 1. Columns: Gaps exceeding 1/8 inch between milled ends not permitted. Shim acceptable gaps with non-tapered mild steel shim stock.
- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
  - 1. Verify structural-steel materials and inspect steel frame joint details.
  - 2. Verify weld materials and inspect welds.
  - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
  - 1. The Inspector shall observe all Direct Tension Indicators to see if proper tightness is achieved.
- D. Welded Connections: Field welds will be visually inspected according to AWS D1.1, the governing building code, and Part 2 of this document, by the Testing Agency.
  - 1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
    - a. Liquid Penetrant Inspection: ASTM E 165.
    - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
    - c. Ultrasonic Inspection: ASTM E 164.
    - d. Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
  - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
  - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.
- F. Defective Work:
  - 1. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents. Work deemed defective will be removed from the site at the Contractor's expense.
  - 2. Any special tests not specifically covered by this specification that are proposed by the Contractor as a result of failure to comply with this Section shall be at the

Contractor's expense. The Contractor shall be responsible for any consequential costs or delays.

3. The results of those tests will be accepted, at the discretion of the Architect, as proof of adequate materials or workmanship.

### **3.06 REPAIRS AND PROTECTION**

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A780.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
  2. Steel that remains exposed to the weather or to a corrosive atmosphere shall receive an additional coat of metal protection of another color after erection.
- C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 "Exterior Painting" and "Interior Painting" Section.
- D. Touchup Priming: Cleaning and touchup priming are specified in Division 09 "High-Performance Coatings."
- E. Repair of Openings: For all members exposed to view in the final structure, close all lifting holes, access openings, etc. in such a manner that no visual evidence of the opening remains.

END OF SECTION 05 1200



## **SECTION 05 4000 – COLD -FORMED 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. Exterior non-load-bearing wall framing.
  - 2. Soffit framing.

#### **1.3 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. Shop Drawings:
  - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
  - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- C. Delegated-Design Submittal: For cold-formed steel framing.

#### **1.5 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
  - 1. Steel sheet.
  - 2. Expansion anchors.
  - 3. Power-actuated anchors.
  - 4. Mechanical fasteners.
  - 5. Vertical deflection clips.
  - 6. Horizontal drift deflection clips
  - 7. Miscellaneous structural clips and accessories.
- D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

#### **1.6 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. All Steel & Gypsum Products, Inc.
  - 2. California Expanded Metal Products Company.
  - 3. Clark Western Building Systems, Inc.
  - 4. Consolidated Fabricators Corp.; Building Products Division.
  - 5. Craco Mfg., Inc.
  - 6. Custom Stud Inc.
  - 7. Design Shapes in Steel.
  - 8. Dietrich Metal Framing; a Worthington Industries Company.
  - 9. Formetal Co. Inc. (The).
  - 10. MarinoWARE.
  - 11. Nuconsteel; a Nucor Company.
  - 12. Olmar Supply, Inc.
  - 13. Quail Run Building Materials, Inc.
  - 14. SCAFCO Corporation.
  - 15. Southeastern Stud & Components, Inc.
  - 16. State Building Products, Inc.
  - 17. Steel Construction Systems.
  - 18. Steel Network, Inc. (The).
  - 19. Steel Structural Systems.
  - 20. Steeler, Inc.
  - 21. Super Stud Building Products, Inc.
  - 22. Telling Industries, LLC.
  - 23. United Metal Products, Inc.
  - 24. United Steel Manufacturing.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
  - 1. Design Loads: As indicated.
  - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 for non-masonry siding and 1/600 for masonry veneer of the wall height (deflection limit based on 10year wind occurrence interval).
    - b. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height with non-brittle finish.
    - c. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/600 of the wall height with brittle finish (brick, stone, precast or cmu).
    - d. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft.
    - e. Ceiling Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
  4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
    - a. Upward and downward movement of 3/4 inch (19 mm).
  5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Design Standards:
1. Wall Studs: AISI S211.
  2. Headers: AISI S212.
  3. Lateral Design: AISI S213.
  4. Floor and roof systems: AISI S210.
- D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- E. Fire-Resistance Ratings: Comply with ASTM E 119; testing 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.

## **2.3 COLD-FORMED STEEL FRAMING, GENERAL**

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: ST33H (ST230H)] for 18ga and thinner ST50H (ST340H) for 16ga and thicker.
  2. Coating: G60 (Z180), or equivalent.
- B. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance.
  2. Coating: G60 (Z180).

## **2.4 LOAD-BEARING WALL FRAMING**

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0538 inch.
  2. Minimum Flange Width: 1-5/8 inches (41 mm).
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm).
  2. Minimum Flange Width: 1-1/4 inches (32 mm).
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm).
  2. Flange Width: as indicated.
  3. Section Properties: as indicated.

## **2.5 CEILING JOIST FRAMING**

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes, with stiffened flanges, and as follows:
  - 1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
  - 2. Flange Width: 1-5/8 inches (41 mm), minimum.

## **2.6 FRAMING ACCESSORIES**

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
  - 1. Supplementary framing.
  - 2. Bracing, bridging, and solid blocking.
  - 3. Web stiffeners.
  - 4. Anchor clips.
  - 5. End clips.
  - 6. Foundation clips.
  - 7. Gusset plates.
  - 8. Stud kickers and knee braces.
  - 9. Joist hangers and end closures.
  - 10. Hole reinforcing plates.
  - 11. Backer plates.

## **2.7 ANCHORS, CLIPS, AND FASTENERS**

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by mechanically deposition according to ASTM B 695, Class 50.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
  - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

## **2.8 MISCELLANEOUS MATERIALS**

- A. Galvanizing Repair Paint: ASTM A 780.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and

plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.

- D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

## **2.9 FABRICATION**

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
  - 1. Fabricate framing assemblies using jigs or templates.
  - 2. Cut framing members by sawing or shearing; do not torch cut.
  - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
  - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
  - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
  - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

### **3.3 INSTALLATION, GENERAL**

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
  - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
  - 1. Cut framing members by sawing or shearing; do not torch cut.
  - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
  - 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### **3.4 LOAD-BEARING WALL INSTALLATION**

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to bottom track unless otherwise indicated. Space studs as follows:
  - 1. Stud Spacing: As indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
  2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
  3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- E. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

### **3.5 FIELD QUALITY CONTROL**

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### **3.6 REPAIRS AND PROTECTION**

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

**END OF SECTION 05 4000**

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## **SECTION 06 1000 - ROUGH CARPENTRY**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Wood blocking, nailers, and supports.

#### **1.03 REFERENCE STANDARDS**

- A. AFPA (NDS) - National Design Specification for Wood Construction 2018.
- B. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings 2018, with Errata (2019).
- C. AFPA (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings 2012.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- E. ASTM D7438 - Standard Practice for Field Calibration and Application of Hand-Held Moisture Meters 2020.
- F. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings 2018, with Errata (2019).
- G. AWP4 M4 - Standard for the Handling, Storage, Field Fabrication and Field Treatment of Preservative-Treated Wood Products 2021.
- H. AWP4 U1 - Use Category System: User Specification for Treated Wood 2022.
- I. PS 20 - American Softwood Lumber Standard 2021.
- J. SPIB (GR) - Standard Grading Rules 2021.
- K. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17 2018.
- L. WWP4 G-5 - Western Lumber Grading Rules 2021.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide technical data for each wood preservative materials and Fire retardant treated materials. Provide material certificates for all lumber and plywood.
  - 1. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for handling, storage, installation and finishing of treated material.
- C. Test Reports: Indicating Moisture content prior to installation of wood products.
- D. Letter of Certification for Pressure Treatment: Submit Certification from treatment plant stating chemicals and processes used and net amount of preservatives retained are in conformance with specified standards.

#### **1.05 QUALITY ASSURANCE**

- A. Moisture Protection: General Contractor must develop a moisture protection plan and moisture control plan for wood materials. Coordinate with manufacturers of materials. Plans should include the following:
  - 1. Coordination of material delivery to reduce on-site exposure time.
  - 2. Keeping material away from ground and method for providing sufficient clearances to provide sufficient air flow beneath packages.
  - 3. Process and method for end sealing exposed end grain of wood members for temporary protection. Allowable methods of protection include water repellent and primer. Coordinate these methods with Architect where material is anticipated to be exposed to view or receive finishes after installation.

4. Wraps and tarps to protect wood from precipitation during storage and construction. Material used must not trap moisture beneath covering.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar material. Cover all wood materials to prevent wetting. Ventilate covering to prevent the build up of condensation.
  1. In the event that wood structural members do get wet, make sure such members are completely dried out before installing or applying other building materials to prevent wood movement during the drying process from affecting those materials. Immediately remove any standing water or snow from horizontal surfaces, to allow wet surfaces to dry as quickly as possible.
- C. Protect moisture sensitive materials, including but not limited to wood materials, from the accumulation of moisture.
  1. Avoid storing materials where they are exposed to rain, snow or standing water.
  2. Keep materials covered. Make sure coverings are ventilated to prevent the accumulation of condensation.
  3. "Dry-in" the structure as quickly as possible. Make sure weather resistive barrier is intact to keep installed materials from being exposed to excess moisture once removed from protective storage.
  4. Immediately remove standing water from moisture sensitive materials, including but not limited to wood framing and sheathing.
  5. End seal exposed end grains of wood members using a water repellant or primer for temporary protection. Where member is to be exposed to view in final installation or scheduled to receive finishes coordinate water repellant/primer with Architect.

#### **1.07 PROJECT CONDITIONS**

- A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other work.

### **PART 2 PRODUCTS**

#### **2.01 GENERAL REQUIREMENTS**

- A. Lumber Standards: Comply with PS 20 and with applicable grading rules of inspection agencies certified by the American Lumber Standards Committee (ALSC) Board of Review.
  1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
  2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at [www.alsc.org](http://www.alsc.org), and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
  3. Grade Stamps: Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, species, moisture content at time of surfacing and mill.
- B. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.
  1. Provide dressed lumber, S4S, unless otherwise indicated.
  2. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment, for sizes 2 inches or less in thickness, unless otherwise indicated.

3. Provide engineer wood products, including plywood and oriented strand board (OSB), glue laminated lumber and structural composite lumber with 15 percent maximum moisture content.

## **2.02 WOOD PRESERVATIVE-TREATED MATERIALS**

- A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with AWP A U1. Mark each treated item with Quality Mark Requirements of inspection agency approved by ALSC's Board of Review.
  1. Preservative chemical products containing chromium, arsenic, creosote, pentachlorophenol, copper naphthenate or copper 8-quinolinolate are prohibited.
  2. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- B. Pressure treat wood members with waterborne preservatives as follows:
  1. Aboveground items: Minimum retention rate of 0.25 lb./cu. ft.
  2. Members in contact with ground or freshwater: Minimum retention rate of 0.40 lb./cu.ft.
  3. Kiln-dry material to maximum moisture content, after treatment (KDAT), as follows:
    - a. Wood: 19 percent.
- C. Treat indicated items and the following:
  1. Wood nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing and flashing.
- D. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment per AWP A M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

## **2.03 ACCESSORIES**

- A. Fasteners and Anchors: Provide fasteners of size and type indicated to comply with requirements specified.
  1. Where rough carpentry is exposed to weather, in ground contact or in areas of high relative humidity, provide fasteners made of Hot-dipped galvanized steel per ASTM A 153/A 153M or type 304 stainless steel.
  2. Where fastener is in contact with wood preservative treated wood provide fasteners of Type 304 or 316 Stainless Steel.
  3. Nails, Wire, Brads, and Staples: ASTM F 1667.
  4. Power-Driven Fasteners: CABO NER-272.
  5. Wood Screws: ASME B18.6.1.
  6. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M)
  7. Bolts: Steel bolts per ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

## **2.04 FACTORY WOOD TREATMENT**

- A. Treated Lumber and Plywood: Comply with requirements of AWP A U1 - Use Category System User Specification for Treated Wood determined by use categories, expected service conditions, and specific applications.
  1. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.
  2. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment per AWP A M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
- B. Preservative Pressure Treatment of Lumber Above Grade: AWP A U1 , Use Category UC3B, Commodity Specification A using waterborne preservative to 0.10 lb/cu ft retention.
  1. Treat lumber in contact with roofing, flashing, or waterproofing.
  2. Treat lumber in contact with masonry or concrete.
  3. Treat lumber less than 18 inches above grade.
- C. Preservative Pressure Treatment of Lumber in Contact with Soil: AWP A U1, Use Category UC4A, Commodity Specification A using waterborne preservative to 0.31 lb/cu ft retention.

- D. Pressure Treatment of Plywood: AWP A U1 using waterborne preservative to 0.25 lb/cu ft retention.
  - 1. Kiln dry after treatment to maximum moisture content of 19 percent.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine substrates and supporting structure and conditions under which the rough carpentry work is to be installed.
  - 1. Notify General Contractor in writing of conditions detrimental to the work.
  - 2. Do not proceed with installation until unsatisfactory conditions have been corrected in manner acceptable to Installer.

#### **3.02 INSTALLATION - GENERAL**

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.
- D. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- E. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- F. Discard units of material with defects that impair quality of rough carpentry and those too small to use with minimum number of joints or optimum joint arrangement.
- G. Apply field treatment per AWP A M4 to cut surfaces of preservative-treated lumber and plywood.
- H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. "Recommended Nailing Schedule" of AFPA (NDS) and AWC (WFCM)
- I. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not fully penetrate members where opposite side is exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.
- J. Use hot-dip galvanized or stainless-steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.
- K. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

#### **3.03 BLOCKING, NAILERS, AND SUPPORTS**

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim. Form shapes shown and cut as required for true line and level of attached work.
- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

- F. Locations requiring non-structural framing and blocking include but are not limited to the following:
1. Cabinets and shelf supports.
  2. Wall brackets.
  3. Handrails.
  4. Grab bars.
  5. Towel and bath accessories.
  6. Wall-mounted door stops.
  7. Chalkboards and marker boards.
  8. Wall paneling and trim.
  9. Attachments for wall mounted equipment, partitions and accessories.
  10. Joints of rigid wall coverings that occur between studs.

### **3.04 TOLERANCES**

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

### **3.05 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Moisture Content: Test dimension lumber for moisture content prior to installation on building. If dimension lumber exceeds 19 percent moisture content notify Architect immediately, for direction. Test wood sheathing for moisture content prior to installation. If sheathing or other composite lumber materials exceed 12 percent moisture content notify Architect immediately for direction.
- C. Moisture Meter: Measure moisture content of wood using a capacitance based moisture meter (Pinless moisture meter or a meter utilizing electromagnetic field technology) that has been calibrated in accordance with ASTM D7438.

### **3.06 PROTECTION**

- A. "Dry-in" the structure as quickly as possible. Make sure weather resistive barrier is intact to keep installed materials from being exposed to excess moisture once removed from protective storage.
- B. Immediately remove standing water and snow from moisture sensitive materials, including but not limited to wood framing and sheathing.

### **END OF SECTION**

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## **SECTION 06 4023 - INTERIOR ARCHITECTURAL WOODWORK**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Architectural cabinets including:
  - 1. Laminate clad cabinets.
- B. Solid surfacing material countertops.
- C. Manufactured stone countertops
- D. Installation of architectural woodwork.

#### **1.03 REFERENCES**

- A. ANSI A135.4 - Basic Hardboard 2012 (Reaffirmed 2020).
- B. ANSI A208.1 - American National Standard for Particleboard 2022.
- C. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications 2022.
- D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
- E. BHMA A156.18 - Materials and Finishes 2020.
- F. BHMA A156.9 - Cabinet Hardware 2020.
- G. NEMA LD 3 - High-Pressure Decorative Laminates 2005.
- H. PS 1 - Structural Plywood 2019.

#### **1.04 DEFINITIONS**

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's product data for each product and process specified as work of this Section and incorporated into items of architectural woodwork during fabrication, finishing and installation.
- C. Shop Drawings: Submit shop drawings showing location of each item, dimensioned plans and elevations, large scale details, attachment devices and other components.
  - 1. Prepare shop drawings at scale not less than 1/4 inch for composite plans, 3/4 inch for enlarged plans, 3/4 inch for elevations, 3/4 inch for sections and 3 inch for details.
  - 2. Identify core material wherever used.
- D. Samples for Verification Purposes: Submit samples as follows:
  - 1. Submit actual samples of laminates and solid surfacing / manufactured stone for confirmation.
  - 2. Submit actual sample items of proposed pulls and hinges, demonstrating hardware design, quality, and finish.
  - 3. Laminate clad panel products, 8-1/2 inches by 11 inches for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
- E. Qualification Data: Submit written information to establish installer qualifications, demonstrating capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information as required.

## **1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Firm experienced in successfully producing architectural woodwork similar to this Project, with sufficient production capacity to produce required units without causing delay in the Work.
- B. Quality Standard: Unless otherwise indicated, comply with AWI/AWMAC/WI (AWS) for grades of interior architectural woodwork, construction, finishes and other requirements.
- C. Assume undivided responsibility for architectural woodwork including fabrication, finishing and installation.

## **1.07 PRE-INSTALLATION MEETING**

- A. Schedule a pre-installation conference minimum two weeks prior to delivery, and installation, of architectural woodwork and associated work.
  - 1. Meet at the Project Site with the following parties in attendance.
    - a. Architect.
    - b. Owner's Representative.
    - c. General Contractor.
    - d. Installers of architectural woodwork, wet work, plaster, finish painting, and other finishes.
    - e. Installers of associated work, including architectural, mechanical, electrical, and communications trades work.
    - f. Firms or person responsible for continued operation (whether temporary or permanent) of HVAC system as required to maintain temperature and humidity conditions.
    - g. Other parties concerned with performance of architectural woodwork.
  - 2. Review coordination and environmental controls required for proper installation and ambient conditioning in areas to receive work.
  - 3. Tour representative areas where architectural woodwork is to be installed.
    - a. Inspect and discuss conditions to be encountered.
    - b. Discuss preparation work required to be performed by other trades.
  - 4. Proceed with woodwork installation only where everyone concerned agrees that required ambient conditions can be maintained.
- B. General Contractor shall record discussion, including agreement or disagreement on significant matters. Furnish copies of report to all parties present within 5 days after meeting date.
  - 1. If substantial disagreements exist at conclusion of meeting, determine how disagreements will be resolved, and set date and time to reconvene meeting.

## **1.08 DELIVERY, STORAGE, AND PROTECTION**

- A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver woodwork until painting, wet work, grinding and similar operations that could damage, soil or deteriorate woodwork have been completed in installation areas.
  - 1. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Environmental Requirements".

## **1.09 PROJECT CONDITIONS**

- A. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturer's schedule with construction progress to avoid delay of Work.
  - 1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with manufacturer of woodwork without field measurements. Coordinate other construction to ensure actual dimensions correspond to guaranteed dimensions.



## **1.10 ENVIRONMENTAL REQUIREMENTS**

- A. Environmental Conditions: Obtain and comply with Woodwork Manufacturer's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation.
  - 1. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. High-Pressure Decorative Laminate:
  - 1. Manufacturer: Subject to compliance with requirements, provide high pressure decorative laminates by one of the following:
    - a. Formica Corp.
    - b. Laminart.
    - c. Nevamar Corp.
    - d. Wilsonart International
- B. Solid Surfacing Material:
  - 1. Manufacturer: Subject to compliance with requirements, provide solid surfacing material by one of the following:
    - a. Corian; DuPont Polymers.
    - b. Solid Surfacing; Formica Corp.
    - c. Gibraltar; Wilsonart International
- C. Substitutions: See Section 01 25 00 - Substitution Procedures.

### **2.02 MATERIALS**

- A. Provide materials that comply with requirements of the AWS Woodwork Standards for each type of lumber, panel product, woodwork and quality grade indicated, and where the following products are part of woodwork with requirements of the referenced product standards, that apply to product characteristics indicated.
  - 1. Hardboard: ANSI A135.4.
  - 2. High Pressure Laminate: NEMA LD 3.
  - 3. Wood Particleboard: ANSI A208.1.
  - 4. Medium-Density Fiberboard: ANSI A208.2.
  - 5. Softwood Plywood: PS 1.
- B. High Pressure Decorative Laminates: Comply with referenced standard and provide colors matching selections on Room Finish Schedule. Acceptability of any manufacturer is contingent upon availability of patterns, colors, sheens and textures matching selections as acceptable to Architect.

### **2.03 MILLWORK HARDWARE AND ACCESSORIES**

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Section 08 7100 - Door Hardware.
  - 1. Coordinate electrical Sections and contractors for templating of electrical components installed in millwork.
- B. Hardware Standard: Comply with BHMA A156.9 for items indicated by reference to BHMA numbers or referenced to this standard.
- C. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA code number indicated.
  - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base metal; BHMA 652 for steel base metal
- D. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of BHMA A156.9.

- E. Bumpers (silencers) for cabinet doors and drawers: Provide non-staining, non-marring pressure sensitive adhesive backed polyurethane bumpers. 3M; Bumpon protective products SJ Series
  - 1. Thickness: 0.110 inch.
  - 2. Color: Clear
  - 3. Style: Cylindrical, Tapered Square or Other provided the impact surface is flat.
- F. Pulls: Wire type, 4 inches center to center;
  - 1. Richelieu; Model 305, product number - BP30596900, matte black.
- G. Drawer Slides: Full extension type, zinc finish.
  - 1. Box Drawer: 100 pound rating
    - a. Touch Release: Accuride 3832EHDTR
    - b. Easy Close: Accuride 3832EC
- H. Hinges: Concealed type, 170 degree opening; Blum Clip 170 Series.

## **2.04 FABRICATION**

- A. Wood Moisture Content: Comply with requirements of Architectural Woodwork Standards for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.
- B. Fabricate woodwork to dimensions, profiles and details indicated.
- C. Complete fabrication including assembly, finishing and hardware application before shipment to project site to maximum extent possible.
  - 1. Disassemble components only as necessary for shipment and installation.
  - 2. Where necessary for fitting at site, provide ample allowance for scribing, trimming and fitting.
- D. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work and similar items.
  - 1. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings.
  - 2. Smooth edges of cut-outs and, where located in countertops and similar exposures, seal edges of cut-outs with a water-resistant coating.
- E. Provide only medium density fiberboard or particleboard substrates for plastic laminates and melamines. Plaster, gypsum board or concrete are NOT considered appropriate substrates.

## **2.05 LAMINATE-CLAD ARCHITECTURAL CABINETS (CASEWORK)**

- A. Quality Standard: Comply with AWI/AWMAC/WI (AWS) Section 10 - Casework, unless more stringent requirements are indicated.
  - 1. Grade: Custom.
- B. AWS Type of Cabinet Construction: Flush overlay.
- C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
  - 1. Horizontal Surfaces Other than Tops: Grade HGS, 0.048-inch nominal thickness.
  - 2. Vertical Surfaces: Grade HGS, 0.048-inch nominal thickness.
  - 3. Edges: 3mm PVC edge banding at exposed edges. Where edges are against a wall or vertical cabinet panel, provide laminate edge banding matching face laminate.
    - a. PVC Edgebanding Color: Match laminate.
- D. Laminate Cladding for Semi-Exposed Surfaces: As follows:
  - 1. Surfaces Other than Drawer Bodies: High pressure decorative laminate, Grade VGS, 0.028-inch nominal thickness.
  - 2. Drawer Sides and Backs: Hardwood plywood, shop finish.
  - 3. Drawer Bottoms: Hardwood plywood, shop finish.
- E. Subtops: Softwood Plywood. Provide with Exposure 1 plywood at sink areas and as indicated.

- F. Colors, Patterns, and Finishes: Provide materials and products complying with the following requirements.
  - 1. Match selections on Room Finish Schedule as acceptable to Architect.

## **2.06 MANUFACTURED STONE COUNTERTOPS**

- A. Quality Standard: Comply with AWI/AWMAC/WI (AWS) Section 11 - Countertops, unless more stringent requirements are indicated.
  - 1. Grade: Premium
- B. Fabrication: Fabricate tops in one piece with shop-applied backsplash and edges, unless otherwise indicated. Comply with solid surfacing material manufacturer's recommendations for adhesives, sealers, fabrication, and finishing.
  - 1. Drill holes in countertops for plumbing fittings and soap dispensers in the shop.
- C. Solid Surfacing Material Thickness: 1/2 inch (12 mm).
- D. Support Frame/Subtops: Provide Softwood Plywood, typically. Provide with Exposure 1 plywood at sink areas and as indicated.
- E. Colors, Patterns, and Finishes: Provide materials and products complying with the following requirements.
  - 1. Match selections on Room Finish Schedule as acceptable to Architect.

## **2.07 FASTENERS AND ANCHORS**

- A. Screws: Select material, type, size and finish required for each use.
  - 1. For metal framing supports, provide screws as recommended by metal framing manufacturer.
- B. Nails: Select material, type, size and finish required for each use.
- C. Anchors: Select material, type, size and finish required by each substrate for secure anchorage.
  - 1. Provide non-ferrous metal or hot-dip galvanized anchors and inserts where required for corrosion-resistance.
  - 2. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required to be set into masonry work for subsequent woodwork anchorage.
- D. Adhesives: Construction type, suitable for substrates and loads.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrate and conditions under which architectural woodwork is to be installed.
  - 1. Notify General Contractor in writing of conditions detrimental to proper and timely completion of work.
  - 2. Do not proceed with work until unsatisfactory conditions have been corrected in an acceptable manner.

### **3.02 PREPARATION**

- A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.
- B. Prior to installation of architectural woodwork, examine shop fabricated work for completion, and complete work as required, including removal of packing.

### **3.03 INSTALLATION**

- A. Quality Standard: Install woodwork to comply with AWI/AWMAC/WI (AWS) for the grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork plumb, level, true and straight with no distortion. Shim as required using concealed shims. Install to a tolerance of 1/8 inch in 8'-0" for plumb and level (including tops); and with no variation in flushness of adjoining surfaces.

- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. Anchor woodwork to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.
- E. Casework: Install casework plumb, level, and without distortion so doors and drawers fit properly.
  - 1. Install with no more than 1/8 inch sag, bow, or other variation in 96 inches from straight line.
  - 2. Adjust hardware to center doors and drawers in openings.
  - 3. Complete installation of hardware and accessory items as required.
- F. Tops: Anchor securely to base units and other support systems as indicated.

#### **3.04 ADJUSTMENT AND CLEANING**

- A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean woodwork on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

#### **3.05 PROTECTION**

- A. Provide protection for architectural woodwork wherever damage may occur as consequence of other installation work including mechanical, electrical.
  - 1. Maintain protection as required to prevent nicks, scratches, dents, abrasion or other damage.
  - 2. Maintain conditions in manner acceptable to manufacturer/installer, to ensure architectural woodwork is without damage or deterioration at time of Substantial Completion.

#### **END OF SECTION**

## **SECTION 07 8400 - FIRESTOPPING**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.
  - 1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
  - 2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
  - 3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
  - 4. Sealant joints in fire-resistance-rated construction.
- B. Firestop joints in fire and smoke assemblies, walls, and floors to maintain integrity of fire barrier.
  - 1. Floor to floor joints.
  - 2. Floor to wall joints.
  - 3. Head of wall joints.
  - 4. Wall to wall joints.
  - 5. Bottom of wall joints.

#### **1.03 REFERENCE STANDARDS**

- A. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.
- C. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2022.
- D. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).
- E. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems 2015 (Reapproved 2019).
- F. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus 2020.
- G. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015, with Editorial Revision (2021).
- H. ITS (DIR) - Directory of Listed Products Current Edition.
- I. FM 4991 - Approval Standard of Firestop Contractors 2013.
- J. FM (AG) - FM Approval Guide Current Edition.
- K. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems Current Edition, Including All Revisions.
- L. UL (FRD) - Fire Resistance Directory Current Edition.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

- C. Product Data: Provide data on product characteristics, performance ratings, limitations, and design sheet issued by approved testing agency or engineering judgement as applicable.
  - 1. Submit all components of tested assemblies at the same time to Architect for Review. Coordinate with submissions under other Sections including those containing wall insulation, perimeter and floorline firestopping, weather barriers, and metal composite material.
  - 2. Identify intended products and applicable UL or ITS/WH Design No.
  - 3. Submit UL or ITS/WH Design documentation
- D. Shop Drawings: Show materials, installation methods, and relationships to adjacent construction for each through fire-penetration fire stop system, each type of construction condition penetrated, each type of penetrating item; and each fire resistive joint system.
  - 1. SUBMIT SHOP DRAWINGS FOR EACH SPECIFIC INSTALLATION CONDITION. Identify intended products and applicable UL/WH/ITS Design No. with documentation
  - 2. Where Project conditions require modification of a qualified testing and inspection agency's system to suit a particular firestop condition, submit illustration, with modifications marked, approved by firestop system manufacturer's fire-protection engineer.
- E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Installer's qualification statement.

#### 1.05 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
  - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
  - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at [www.icc-es.org](http://www.icc-es.org) will be considered as constituting an acceptable test report.
  - 3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and capable of providing technical/consulting services during construction.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
  - 1. Any of the following:
    - a. UL Qualified Firestopping Contractor
    - b. Approved by Factory Mutual Research under FM Standard 4991, Approval of Firestop Contractors,
    - c. Trained and accredited by the manufacturer. Certification program must consist of at minimum the following:
      - 1) Minimum of one key responsible contact.
      - 2) 9 month initial training period with regular program audits to maintain certification.
      - 3) Field Audits by Manufacturer.
- D. UL Design Numbers: Where UL Design numbers are cited in the Contract Documents the Contractor can obtain the specific information for each UL Design from the following web site and or/purchase a copy of the UL Fire Resistance Directory directly from Underwriters Laboratories. <http://productspec.ul.com>
- E. Single-Source Responsibility: Obtain through-penetration and joint firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.
- F. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy".

## **1.06 FIELD CONDITIONS**

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

## **1.07 COORDINATION**

- A. Coordinate construction of openings and penetrating items to ensure designated through-penetration firestop systems are installed per specified requirements.
- B. Coordinate construction of fire-resistive joint system installations to ensure that designated joint firestop systems are installed per specified requirements.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements provide Basis of Design products or comparable products by one of the following:
  - 1. Hilti, Inc: [www.us.hilti.com/#sle](http://www.us.hilti.com/#sle).
  - 2. Rectorseal
  - 3. Specified Technologies Inc: [www.stifirestop.com/#sle](http://www.stifirestop.com/#sle).

### **2.02 GENERAL REQUIREMENTS**

- A. Prohibited Materials: Do not use the following:
  - 1. At CPVC Pipes do not use 3M CP25WB+ or 3M Fire Dam 150+. Per manufacturers information these products are NOT compatible with CPVC.
  - 2. Do not use any firestopping materials that when in contact with CPVC pipes , fittings and adhesives joining CPVC components, will cause degradation of the piping and or piping joints. If such materials come in contact with the CPVC pipes, fittings and adhesives any costs associated with the replacement of such are the Contractor's responsibility.
- B. Mold and Mildew Resistance: Provide firestoppping materials with mold and mildew resistance rating of zero (0) in accordance with ASTM G21.
- C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- D. Color: All exposed firestopping shall have a readily identifiable color (not white) to allow for visual inspection during construction.
  - 1. Where firestopping is to be exposed to view after completion of construction use gray color to maintain aesthetics.
- E. Fire Ratings: Refer to drawings for required ratings.

### **2.03 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION**

- A. Blank Openings:
  - 1. In Concrete Floors Less than or equal to 5 inches thick or Concrete/CMU Walls less than or equal to 8 inches thick:
    - a. Up to 3 Hour Construction (3 hour F and 3 hour T) (Mortar): UL System C-AJ-0015; Specified Technologies Inc. SSM mortar.
    - b. 3 Hour Construction (3 hour F and 2 Hour T) (Pillows): UL System C-AJ-0061; Specified Technologies Inc. SSB Intumescent Firestop pillows.
    - c. 3 Hour Construction (Up to 4 hour F and 0 hour T) (composite board): UL System C-AJ-0113; Specified Technologies Inc. Composite Sheet.
    - d. Up to 3 hour Construction (3 hour F and 0 & 1/2 hour T) (Mortar): UL System C-AJ-8108; Rectorseal; Metacaulk Mortar
    - e. Up to 3 hour Construction (3 hour F and 1 hour T) (Pillows): UL System C-AJ-1367; Rectorseal; Metacaulk Pillows and Metacaulk 1000

- f. Up to 3 hour Construction (2 & 4 hour F and 0 & 2 hour T) (Composite board): UL System C-AJ-8121; Rectorseal; Metacaulk Fire rated putty, Metacaulk Composite Sheet, Metacaulk Wrap Strip, Metacaulk 1000.
    - g. Up to 4 hour Construction (4 hour F and 4 hour T) (Mortar): UL System C-AJ-0081; Hilti CP637 Mortar
    - h. Up to 2 Hour Construction (2 hour F and 2 hour T) (Board): UL System C-AJ-0105; Hilti CP675T Firestop board.
    - i. Up to 2 Hour Construction (2 hour F and 1 hour T) (Blocks and caulk): UL System C-AJ-0138; Hilti CFS-BL Firestop block with FS-ONE Sealant, FS-ONE MAX Intumescent Sealant, or CP618 Putty Stick
  - 2. In concrete Floors Less than or equal to 5 inches thick or greater than 5 inches thick:
    - a. Up to 2 hour construction (2 hour F and 1 Hour T) ( Cast in place Device): UL System F-A-0005; Hilti CP-680 Series with CP618 Firestop Putty Stick.
  - 3. In Concrete or CMU Walls greater than 8 inches thick:
    - a. Up to 2 hour Construction (2 hour F and 2 hour T) (block): UL System C-AJ-0022; Hilti CFS-BL Firestop Block
- B. Penetrations Through Floors or Walls By:
  - 1. Multiple metal or cable Penetrations in Large Openings:
    - a. Up to 2 Hour Construction (2 hour F and 0 hour T)(Caulk): UL System C-AJ-8138; Rectorseal; Metacaulk MC 150+
    - b. Up to 3 Hour Construction (3 hour F and 0 hour T)(Caulk): UL System C-AJ-8099; Hilti FS-ONE MAX Intumescent Firestop Sealant.
    - c. Up to 3 Hour Construction (3 hour F and 0 hour T) (Caulk): UL System C-AJ-8110; Hilti CFS-BL Firestop Block with FS ONE Sealant, FS-ONE MAX Intumescent Sealant, CP618 Firestop Putty Stick, or CP 620 Firefoam
    - d. Up to 2 Hour Construction (2 hour F, 0 hour T rating)(Caulk): UL System C-AJ-8143; Hilti FS-ONE MAX Intumescent Firestop Sealant. or FS-ONE Sealant
    - e. Up to 2 Hour Construction (2 hour F and 0 to 2 hour T) (mortar): UL System C-AJ-8055; Specified Technologies Inc. product varies depending on penetrant - Refer to UL design.
  - 2. Uninsulated Metallic Pipe, Conduit, and Tubing:
    - a. 3 Hour Construction (Up to 4 hour F and up to 3/4 hour T)(Caulk): UL System C-AJ-1079; Specified Technologies Inc. SSS Intumescent Firestop Sealant.
    - b. Up to 3 Hour Construction (3 hour F, 1/4 hour T)(Caulk): UL System C-AJ-1270; Rectorseal; Metacaulk MC150+
    - c. Up to 3 Hour Construction (3 hour F, 0 hour T)(Caulk): UL System C-AJ-1248; Rectorseal; Metacaulk 835+.
    - d. Up to 3 Hour Construction (3 hour F, 0 hour T)(Caulk): UL System C-AJ-1235; Rectorseal; Metacaulk MC150+.
    - e. Up to 3 Hour Construction (3 hour F, 0 hour T)(Putty): UL System C-AJ-1200; Rectorseal; Metacaulk Putty Stick
    - f. Up to 2 Hour Construction (2 hour F, 0 hour T)(Caulk): UL System C-AJ-1115; Rectorseal; Metacaulk 835+
    - g. Up to 3 Hour Construction (3 hour F, 0 hour T)(Caulk): UL System C-AJ-1184; Hilti FS-ONE MAX Intumescent Firestop Sealant. or FS-ONE Sealant.
    - h. Up to 4 Hour Construction (4 hour F, 0 hour T), : UL System C-AJ-1215; Specified Technologies Inc. LC Endothermic Firestop Sealant.
    - i. Up to 3 Hour Construction (3 hour F, 0 hour T)(Caulk): UL System C-AJ-1226; Hilti FS-ONE MAX Intumescent Firestop Sealant. or FS-ONE Sealant
    - j. Up to 3 Hour Construction (3 Hour F, 2-3/4 hour T) (Caulk): UL System C-AJ-1597; Hilti FS-ONE MAX Intumescent Firestop Sealant, FS-ONE Sealant, CFS-S-SIL-GG, or CFS-S-SIL SL Sealant (floors only)
  - 3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
    - a. Up to 3 Hour Construction (3 hour F and 0 hour T) (device): UL System C-AJ-2106; Specified Technologies Inc. SSW wrap strips.



- b. Up to 3 Hour Construction for pipes 6 inches or smaller ( 3 hour F and 2-1/2 hour T - (Device and Mortar): UL System C-AJ-2269; Rectorseal; Metacaulk Pipe Collar and Metacaulk Fire Rated Mortar.
  - c. Up to 3 Hour Construction for pipes 8 inches or smaller ( 3 hour F and 1-1/2 hour T - (caulk and wrap strip): UL System C-AJ-2265; Rectorseal; Metacaulk Wrap Strip and Metacaulk 1000
  - d. Up to 2 Hour Construction (2 hour F, 1-1/4 hour T)(Caulk): UL System C-AJ-2047; Rectorseal; Metacaulk wrap strip and Metacaulk 1000
  - e. Up to 3 Hour Construction for pipes 6 inches or smaller. 2 hour for PVC & CPVC pipes larger than 6 inches (2 or 3 hour F and 0,2 or 3 hour T - dependent on materials) Refer to UL Design (Device and Caulk): UL System C-AJ-2109; Hilti CP 643N/644 Firestop Collar and FS-ONE MAX Intumescent Firestop Sealant, FS-ONE Sealant, CFS-S-SIL-GG, or CFS-S-SIL SL Sealant (floors only).
  - f. Up to 2 Hour Construction for 2 inch or smaller pipes (2 hour F, 0, 1.25 and 2 hour T dependent on materials) Refer to UL Design (Caulk): UL System C-AJ-2567; Hilti FS-ONE MAX Intumescent Firestop Sealant, FS-ONE Sealant, CFS-S-SIL-GG, or CFS-S-SIL SL Sealant (floors only)
  - g. Up to 2 Hour Construction (2hour F, 0 hour T) (Caulk): UL System C-AJ-2167; Hilti FS-ONE MAX Intumescent Firestop Sealant.
4. Electrical Cables Not In Conduit:
- a. Up to 3 Hour Construction (3 hour F, 1/2 hour T) (Caulk): UL System C-AJ-3085; Specified Technologies Inc. LC Endothermic Firestop Sealant.
  - b. Up to 3 Hour Construction (3 Hour F, 0, 1, 1-1/2 and 3 hour T dependent on materials) Refer to UL Design. (Device and Caulk): UL System C-AJ-3285; Hilti CP653 and FS-ONE MAX Intumescent Firestop Sealant, FS-ONE Sealant, CFS-S-SIL-GG, CFS-S-SIL SL Sealant (floors only), or CP606 Sealant
  - c. Up to 3 Hour Construction (3 hour F, 0 hour T)(Caulk): UL System C-AJ-3208; Hilti CP 618 Firestop Putty Stick.
  - d. Up to 3 Hour Construction (3 hour F, 1/2 Hour T) (device): UL System C-AJ-3231; Specified Technologies Inc. EZ-Path Series 33 Fire-Rated Pathway.
  - e. Up to 2 Hour Construction (2 hour F, 0 and 1/2 hour T dependent on construction)(Caulk and plug) Refer to UL Design: UL System C-AJ-3216; Hilti CFS-PL Firestop Plug and CP 618 Firestop Putty Stick
  - f. Up to 2 hour Construction (2 hour F, 2 Hour T) (Device, Caulk and wrap): UL System C-AJ-3298; Hilti CP 653 Series and FS-ONE Sealant or FS-ONE MAX Intumescent Sealant
  - g. Up to 2 hour Construction (2 hour F, 1/2 Hour T) (Device): UL System C-AJ-3290; Rectorseal; Metacaulk Pipe Collar
  - h. Up to 3 hour Construction (3 hour F, 1 Hour T) (Putty): UL System C-AJ-3101; Rectorseal; Metacaulk Fire Rated Putty
5. Insulated Pipes:
- a. Up to 2 Hour Construction (2 hour F, 1 & 1-1/2 hour T)(Caulk and wrap strip): UL System C-AJ-5078; Rectorseal; Metacaulk 1000
  - b. Up to 2 Hour Construction (2 hour F, 3/4 hour T)(Caulk): UL System C-AJ-5134; Rectorseal; Metacaulk 1000
  - c. Up to 2 Hour Construction (2 hour F, 0 & 3/4 hour T)(Caulk): UL System C-AJ-5284; Rectorseal; Metacaulk 1000
  - d. Up to 2 Hour Construction (2 hour F, 0 and 1 hour T) (Caulk): UL System C-AJ-5091; Hilti FS-ONE IMAX intumescent Firestop Sealant.
  - e. 2 Hour Construction (2 hour F, 3/4 and 1 hour T) (Caulk) : UL System C-AJ-5138; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
  - f. 2 Hour Construction (2 hour F, 1 hour T) (Caulk): UL System C-AJ-5313; Specified Technologies Inc. LC Endothermic Firestop Sealant.
  - g. Up to 2 Hour Construction (2 hour F, 2 hour T)(Caulk and wrap strip): UL System C-AJ-5320; Hilti FS-One Sealant or FS-One MAX Intumescent Sealant and CP-648E Wrap Strip.

- h. Up to 3 Hour Construction (3 hour F, 3 hour T)(Device): UL System F-A-5018; Hilti CP 680 Series
- 6. HVAC Ducts, Uninsulated and Insulated:
  - a. Up to 2 Hour Construction (2 hour F, 0 hour T) (Caulk): UL System C-AJ-7111; Hilti FS-ONE Sealant or FS-ONE MAX Intumescent Sealant.
  - b. Up to 2 hour Construction (2 hour F, 0 hour T) (Caulk): UL System C-AJ-7084; Hilti FS-ONE Sealant, FS-ONE MAX Intumescent Sealant, CP606 Flexible firestop sealant, CP 601S Elastomeric Firestop sealant, CFS-S SIL GG Sealant, or CFS-S-SIL SL Sealant (Floors Only)
  - c. Up to 2 Hour Construction (2 hour F, 1-3/4 hour T) (Caulk): UL System C-AJ-7145; Hilti FS-ONE Sealant or FS-ONE MAX Intumescent Sealant
  - d. Up to 2 Hour Construction (2 hour F, 0 hour T) (Caulk): UL System C-AJ-7154; Hilti CFS-S SIL GG or CFS-S SIL SL (floors only)
  - e. Up to 3 Hour Construction (2 hour F, 1 hour T) (Caulk): UL System C-AJ-7051; Hilti FS-ONE Sealant, FS-ONE MAX Intumescent Sealant, or CP606 Flexible firestop sealant.
  - f. Up to 2 hour Construction (2 hour F, 3/4 hour T) (Caulk): UL System C-AJ-7143; Specified Technologies, Inc.; Spec Seal LCI Sealant.
  - g. Up to 2 hour Construction (3 hour F, 0 and 1/4 hour T) (Caulk): UL System C-AJ-7023; Specified Technologies, Inc.; Spec Seal LCI Sealant.
- C. Penetrations Through Walls or Floors greater than 5 inches thick by:
  - 1. Multiple metal or cable Penetrations in Large Openings:
    - a. Up to 2 Hour Construction (2 hour F, 1/2 hour T rating)(Caulk): UL System C-BJ-8024; Hilti FS-ONE MAX Intumescent Firestop Sealant or FS-ONE Sealant
    - b. Up to 2 Hour Construction (2 hour F, 0 hour T rating)(Mortar): UL System C-BJ-1049; Hilti CP 637
    - c. Up to 4 Hour Construction (4 Hour F, 1/2 hour T rating) (Composite Sheet): UL System C-BJ-3034; Specified Technologies; Spec Seal LCI Sealant and Spec Seal Composite Sheet
  - 2. Uninsulated Metallic Pipe, Conduit, and Tubing:
    - a. Up to 3 Hour Construction (3 hour F, 3 hour T)(Caulk): UL System C-BJ-1059; Hilti FS-ONE MAX Intumescent Firestop Sealant. or FS-ONE Sealant.
    - b. Up to 2 Hour Construction (2 Hour F, 2 Hour T) (Caulk): UL System C-BJ-1047; Hilti CP 620 Fire Foam
    - c. Up to 2 Hour Construction (2 Hour F, 2 Hour T) (Caulk): UL System C-BJ-1055; Hilti FS-ONE Sealant or FS-ONE MAX Intumescent Sealant
    - d. Up to 2 Hour Construction (2 hour F, 0 hour T) (Caulk): UL System C-BJ-1058; Specified Technologies, Inc.; Spec Seal SIL Silicone Firestop Sealant
  - 3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
    - a. Up to 3 hour Construction refer to UL design for pipe sizes as they vary by material (4 hour F , 4 hour T)(Caulk and wrap strip): UL System C-BJ-2017; Hilti CP 648 and FS-ONE MAX Intumescent Firestop Sealant
    - b. Up to 2 Hour Construction refer to UL design for pipe sizes as they vary by material (2 hour F, 2 hour T) (Caulk): UL System C-BJ-2014; Hilti FS-ONE MAX Intumescent Firestop Sealant or FS-ONE Sealant
    - c. Up to 2 Hour Construction, refer to UL design for pipe sizes as they vary by material (2 hour F, 0 hour T) (Caulk): UL System C-BJ- 2046; Specified Technologies, Inc.; SpecSeal LCI Sealant
  - 4. Electrical Cables Not In Conduit:
    - a. Up to 2 Hour Construction (2 hour F, 1/2 hour T)(Caulk) : UL System C-BJ-3024; Hilti FS-ONE Sealant
  - 5. Insulated Pipes:
    - a. Up to 2 Hour Construction 4 inch pipes or smaller (2 hour F, 1 hour T) (Caulk): UL System C-BJ-5013; Hilti FS-ONE Sealant or FS-ONE MAX Intumescent Sealant.

- b. Up to 2 Hour Construction 2 inch pipes or smaller (2 hour F, 1-1/2 hour T)(Caulk): UL System C-BJ-5015; Hilti FS-One Sealant or FS-One MAX Intumescent Sealant.
  - c. Up to 3 Hour Construction 2 inch pipes or smaller (3 hour F, 1/2 hour T)(Caulk): UL System C-BJ-5018; Hilti FS-ONE Sealant or FS-ONE MAX Intumescent Sealant
  - d. Up to 2 Hour Construction (2 hour F, 2 hour T) (Caulk): UL System C-BJ-1065; Specified Technologies, Inc.; Spec Seal LCI Sealant or Spec Seal SIL Silicone Sealant.
6. HVAC Ducts, Uninsulated and Insulated:
- a. Up to 2 Hour Construction (3 hour F, 1/2 hour T) (Caulk): UL System C-BJ-7005; Hilti FS-ONE Sealant or FS-ONE MAX Intumescent Sealant.

## **2.04 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS**

### **A. Blank Openings:**

- 1. Up to 4 Hour Construction (4 hour F, 3/4 hour T) (Device) : UL System W-L-0020; Specified Technologies Inc. Composite Sheet.
- 2. Up to 2 Hour Construction (2 hour F, 0 hour T) (Device): UL System W-L-0032; Specified Technologies Inc. FP Intumescent Firestop Plug.
- 3. Up to 4 hour Construction (2 or 4 hour F, 1/2 or 3/4 hour T) (Board): UL System C-AJ-0088; Rectorseal; Metacaulk Composite Sheet.
- 4. Up to 2 Hour Construction (board and putty): UL System W-L-0014; Hilti CP 675T Firestop Board and either CP619T Fire Putty Roll , CP 618 Firestop Putty Stick, or CP 617 Firestop Putty Pad

### **B. Through Penetrations By:**

- 1. Membrane penetration (Only)
  - a. Uninsulated Metallic Pipe conduit, tubing
    - 1) Up to 1 Hour Construction for pipes 1 inch diameter or less (1 hour F, 1 hour T)(Caulk): UL System F-C-1142; Hilti FS-ONE MAX Intumescent Firestop Sealant. or FS-ONE Sealant
  - b. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
    - 1) Up to 2 Hour Construction (1 or 2 hour F, 1, 1-3/4 and 2 hour T) (Caulk): UL System W-L-2201; Rectorseal; Metacaulk 1000.
    - 2) Up to 2 Hour Construction (2 hour F, 0 hour T) (Caulk): UL System W-L-3310; Hilti FS-ONE Sealant, FS-ONE MAX Intumescent Sealant, or CP 606 Sealant .
    - 3) Up to 1 Hour Construction (1 hour F, 3/4 hour T) (Device and Caulk): UL System W-L-2346; Rectorseal; Metacaulk Wrap Strip and either Metacaulk 1000 or Metacaulk MC 150+ .
  - c. Electrical cables not in conduit
    - 1) Up to 2 Hour Construction (2 hour F, 2 hour T)(device): UL System W-L-3415; Hilti CFS-D Firestop Cable Disc.
- 2. Uninsulated Metallic Pipe, Conduit, and Tubing:
  - a. Up to 2 Hour Construction (2 hour F, 0 hour T) (Caulk): UL System W-L-1090; Specified Technologies Inc. LC Endothermic Firestop Sealant.
  - b. Up to 2 Hour Construction (1 and 2 hour F, 0 hour T) (Caulk): UL System W-L-1152; Rectorseal; Metacaulk MC 150+ or Metacaulk 1000
  - c. Up to 2 Hour Construction (1 and 2 hour F, 0 hour T) (Caulk): UL System W-L-1144; Rectorseal; Metacaulk MC 150+
  - d. Up to 2 Hour Construction (1 and 2 hour F, 0 hour T) (Caulk): UL System W-L-1253; Rectorseal; Metacaulk MC 150+
  - e. Up to 2 Hour Construction (1 and 2 hour F, 0 hour T) (Caulk): UL System W-L-1404; Rectorseal; Metacaulk MC 150+
  - f. Up to 2 Hour Construction (2 hour F, 0 and 1/4 hour T) (Caulk): UL System W-L-1034; Rectorseal; Metacaulk 835+.
  - g. Up to 2 Hour Construction (2 hour F, 0 hour T) (Caulk): UL System W-L-1054; Hilti FS-ONE Sealant or FS-ONE MAX Intumescent Sealant.

- h. Up to 2 Hour Construction (2 hour F, 0 hour T): UL System W-L-1164; Hilti FS-ONE Sealant or FS-ONE MAX Intumescent Sealant.
  - i. Up to 2 Hour Construction (2 hour F, 1/4, 3/4 & 1 hour T) (Caulk): UL System W-L-1222; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
  - j. Up to 2 Hour Construction (2 hour F, 2 hour T) (device): UL System W-L-1477; Specified Technologies Inc. EZ Firestop Grommet.
  - k. Up to 2 Hour Construction with 3/4 inch or smaller penetrants Refer to UL Design (2 hour F, 2 hour T) (Device): UL System W-L-1506; Hilti CFS-D Firestop Cable Disc.
  - l. Up to 1 Hour Construction for pipes 4 inch diameter or less (1 hour F, 1/4 hour T)(Caulk): UL System F-C-1106; Hilti FS-ONE MAX Intumescent Firestop Sealant. or FS-ONE Sealant
  - m. Up to 1 Hour Construction for pipes 1 inch diameter or less (1 hour F, 1 hour T)(Caulk): UL System F-C-1147; Hilti FS-ONE MAX Intumescent Firestop Sealant., FS-ONE Sealant, or CP 606 Flexible Firestop Sealant
3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
- a. Up to 2 Hour Construction (2 hour F, 3/4, 1 and 2 hour T) (device) : UL System W-L-2074; Specified Technologies Inc. SSC Collars.
  - b. Up to 2 Hour Construction (1 and 2 hour F, 1 and 1-1/4 hour T) (Device and caulk): UL System W-L-2199; Rectorseal; Metacaulk 1000 and Metacaulk Wrap Strip
  - c. Up to 2 Hour Construction (1 and 2 hour F, 0 hour T) (Caulk): UL System W-L-2259; Rectorseal; Metacaulk MC150+
  - d. Up to 2 Hour Construction (1 and 2 hour F, 1 and 1-1/2 hour T) (Device): UL System W-L-2255; Rectorseal; Metacaulk Pipe Collar
  - e. Up to 2 Hour Construction (1 and 2 hour F, 0 hour T)(Device): UL System W-L-2168; Rectorseal; Metacaulk Wrap Strip and Metacaulk 1000
  - f. Up to 1 Hour Construction for 4 inch or smaller pipes (1 hour F, 1 hour T) (Device and Caulk): UL System F-C-2302; Rectorseal; Metacaulk Wrap Strip, Metacaulk Pipe Collar and Metacaulk 1000
  - g. Up to 1 Hour Construction (1 hour F, 1 hour T)(Device and caulk): UL System W-L-2135; Rectorseal; Metacaulk Pipe Collar and Metacaulk 1000
  - h. Up to 2 Hour Construction (2 hour F, 2 hour) (Device and caulk): UL System W-L-2021; Rectorseal; Metacaulk Pipe Collar and Metacaulk 1000
  - i. Up to 2 Hour Construction (2 hour F, 0,1 or 2 hour T dependent on construction) (Device and caulk): UL System W-L-2078; Hilti CP 643N/644 Firestop Collar with either FS-ONE Sealant or FS-ONE MAX Intumescent Sealant
  - j. Up to 2 Hour Construction (2 hour F, 0 hour T) (Caulk): UL System W-L-2128; Hilti FS-ONE Sealant or FS-ONE MAX Intumescent Sealant.
  - k. Up to 2 Hour Construction (2 hour F, 2 hour T) (device): UL System W-L-2237; Specified Technologies Inc. LCC Intumescent Firestop Collars.
  - l. Up to 2 Hour Construction (2 hour F, 1, 1-1/2 and 2 hour T) (device): UL System W-L-2243; Specified Technologies Inc. SSW Wrap Strips.
4. Electrical Cables Not In Conduit:
- a. Up to 4 Hour Construction (4 hour F, 0 hour T) (device): UL System W-L-3276; Specified Technologies Inc. Ready-Sleeve.
  - b. Up to 4 Hour Construction (4 hour F, 1 hour T) (device): UL System W-L-3304; Specified Technologies Inc. Ready Split Sleeve.
  - c. Up to 4 Hour Construction (4 hour F, 3/4, 1, 1-1/2 & 2 hour T) (device) : UL System W-L-3377; Specified Technologies Inc. EZ-Path Series 22 Fire-Rated Pathway.
  - d. Up to 2 Hour Construction (2 hour F, 2 hour T) (putty) : UL System W-L-3024; Specified Technologies Inc. SSPFirestop Putty.
  - e. Up to 2 Hour Construction (1 and 2 hour F, 1/2 and 3/4 hour T)(Caulk): UL System W-L-3188; Rectorseal; Metacaulk MC 150+
  - f. Up to 2 Hour Construction (1 and 2 hour F, 1/2 and 1 hour T)(Caulk and Putty): UL System W-L-3354; Rectorseal; Metacaulk 1000 or Fireputty Pad.
  - g. Up to 2 Hour Construction (1 and 2 hour F, 0 hour T)(Caulk): UL System W-L-3199; Rectorseal; Metacaulk 150+

- h. Up to 2 Hour Construction (2 hour F, 0 hour T) (caulk): UL System W-L-3065; Hilti FS-ONE Sealant, FS-ONE MAX Intumescent Sealant, CP601S Elastomeric Sealant, CP 606 Sealant , or CP 618 Putty
- i. Up to 2 Hour Construction (2 hour F, 1/2 hour T) (device): UL System W-L-3084; Specified Technologies Inc. SSB Intumescent Firestop Pillows.
- j. Up to 2 Hour Construction (2 hour F, 0 hour T) (Putty): UL System W-L-3135; Specified Technologies Inc. SSPFirestop Putty.
- k. Up to 2 Hour Construction (2 hour F, 14 and 3/4 hour T) (caulk): UL System W-L-3169; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
- l. Up to 4 hour construction (4 hour F, 0, 1/2, 1-1/2 or 2 hour T dependent on construction) (Device): UL System W-L-3334; Hilti CP 653 Speed Sleeve with either FS-ONE Sealant, FS-ONE MAX Intumescent Sealant, or CP 606 Sealant
- m. Up to 2 Hour Construction (2 hour F, 0,1/2, 1 or 2 hour T depercent on construction)(device): UL System W-L-3414; Hilti CFS-D Firestop Cable Disc.
- 5. Insulated Pipes:
  - a. Up to 2 Hour Construction (2 hour F, 1 hour T) (caulk): UL System W-L-5014; Specified Technologies Inc. SSS Intumescent Firestop Sealant.
  - b. Up to 2 hour Construction. Refer to UL Design. (1 and 2 hour F, 1 and 1-1/2 hour T) (Caulk): UL System W-L-5057; Rectorseal; Metacaulk 1000
  - c. Up to 2 hour Construction. Refer to UL Design. (1 and 2 hour F, 1 hour T) (Caulk): UL System W-L-5059; Rectorseal; Metacaulk 1000
  - d. Up to 2 hour Construction. Refer to UL Design. (1 and 2 hour F, 1-3/4 hour T) (Caulk): UL System W-L-5205; Rectorseal; Metacaulk 1000
  - e. Up to 2 hour Construction. Refer to UL Design. (1 and 2 hour F, 1 and 1-3/4 hour T) (Caulk): UL System W-L-5207; Rectorseal; Metacaulk 1000
  - f. Up to 3 Hour Construction (3 hour F, 0, 1/2, 1 or 1-1/4 hour T dependent on materials) (Caulk): UL System W-L-5029; FS-ONE Sealant or FS-ONE MAX Intumescent Sealant.
  - g. Up to 2 Hour Construction (2 hour F, 1 hour T) (caulk): UL System W-L-5121; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
  - h. Up to 2 hour Construction with up to 20 inch pipes depending on material. Refer to UL Design. (2 hour F, 0, or 1-1/2 hour T) (Caulk): UL System W-L-5047; Hilti FS-ONE Sealant or FS-ONE MAX Intumescent Sealant
- 6. HVAC Ducts,:
  - a. Up to 2 Hour Construction (1 and 2 hour F, 0 hour T) (Caulk): UL System W-L-7027; Rectorseal; Metacaulk 1000
  - b. Up to 2 Hour Construction (2 hour F, 0 hour T) (Caulk): UL System W-L-7156; Hilti FS-ONE Sealant or FS-ONE MAX Intumescent Sealant.
  - c. Up to 2 Hour Construction (2 hour F, 3/4 hour T): (device) UL System W-L-7164; Specified Technologies Inc. FyreFlange HVAC Firestop Angle.
  - d. Up to 2 Hour Construction (2 hour F, 1/4 hour T) (device): UL System W-L-7238; Specified Technologies Inc. FyreFlange HVAC Firestop Angle.
  - e. Up to 2 Hour Construction (2 hour F, 0 hour T) (Caulk): UL System W-L-7042; Hilti FS-ONE Sealant, FS-ONE MAX Intumescent Sealant, CP 601S Elastomeric Firestop Sealant, or CP 606 Flexible Firestop Sealant.
  - f. Up to 2 Hour Construction (2 hour F, 1/2 hour T) (Caulk): UL System W-L-7153; Hilti FS-ONE Sealant or FS-ONE MAX Intumescent Sealant.

## 2.05 PENETRATION FIRESTOPPING SYSTEMS

- A. Firestopping:
  - 1. Use systems listed above or comparable systems by specified manufacturers listed by UL, WH or tested in accordance with ASTM E814 by a testing agency acceptable to the authorities having jurisdiction, that has an F rating equal to or greater that that of the penetrated assembly and that meets all other specified requirements.
- B. Firestopping at floor and floor/ceiling assemblies:

1. Use systems listed above or comparable systems by specified manufacturers listed by UL, WH or tested in accordance with ASTM E814 by a testing agency acceptable to the authorities having jurisdiction, that has an F rating AND a T rating equal to or greater than that of the penetrated assembly and that meets all other specified requirements.
  - a. Where floor penetrations meet one of the following criteria the requirement for the T rating may be waived in accordance with the locally enforced building code however the need for the F rating still remains:
    - 1) Where floor penetrations are within the cavity of a wall, either above or below the rated floor, floor/ceiling  
OR
    - 2) where the penetration is for a floor drain, a shower drain or a tub drain within the concealed space of a horizontal assembly.

## **2.06 FIRE-RESISTIVE JOINT SYSTEMS**

- A. Materials listed in UL "Fire Resistance Directory" under product Category XHBN for the following systems, or equivalent by Warnock/Hersey Intertek as acceptable to the authorities having jurisdiction. Use systems listed above or comparable systems by specified manufacturers.

## **2.07 ACCESSORIES**

- A. Fill, Void, or Cavity Materials: Materials listed in UL "Fire Resistance Directory" under Category XHHW.
- B. Forming Materials: Materials listed in UL "Fire Resistance Directory" under Category XHKU.
- C. Safing Insulation: Mineral fibers formed into blankets, complying with ASTM C665, rated non-combustible by NFPA in accordance with ASTM E84, density not less than 4.0 lbs. per. cu. ft., fire resistant in accordance with ASTM E119, formulated for fire containment at floor perimeters.
  1. Safing Clips: Galvanized steel safing clips approved by safing insulation manufacturer for holding insulation in place.
  2. Caulking Compound: Material approved by safing insulation manufacturer for sealing joint between foil backing of safing insulation and edge of adjacent construction against penetration of smoke.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.02 CONDITIONS REQUIRING FIRESTOPPING**

- A. Provide firestopping for conditions specified whether or not firestopping is indicated, and if indicated, whether such material is designated as insulation, safing, or otherwise.
  1. Insulation types specified in other Sections shall not be installed in lieu of firestopping material specified herein.
- B. Penetrations: Included are conduit, cable, wire, pipe, duct, or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition and through one or both surfaces of a non-rated smoke partition.
  1. Where a penetration occurs through a structural floor or roof, except slab on grade, and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, provide firestopping to fill such spaces per ASTM E 814 and UL 2079 for dynamic movement.
  2. Where penetrations occur at fire-rated walls or partitions of solid type construction, provide firestopping to completely fill spaces around the penetration, per ASTM E 814.

3. Where penetrations occur at fire-rated walls or partitions of hollow type construction, provide firestopping to completely fill spaces around the penetration, on each side of the wall or partition, per ASTM E 814.
  4. Requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons, or other trim. If penetrations are sleeved, firestop annular space, if any, between sleeve and wall opening.
- C. Exterior Building Perimeters: Where exterior face construction is continuous past a structural floor, and a space remains open between the inner face of the wall construction and the outer perimeter edge of the structural floor, provide firestopping to equal the fire resistance of the floor assembly.
1. Safing insulation by itself is not an acceptable firestop, nor is safing insulation with beads of caulk applied along the length of the curtainwall and/or floor slab junctures. If the safing insulation is part of the firestop system, the safing insulation must be completely covered by the appropriate thickness of UL listed Firestop Sealant Material for that UL listed Firestop System.
  2. Provide firestopping system regardless of any clips, angles, plates, or other members bridging or interconnecting the facing and floor system, whether or not such items are continuous.
  3. Provide firestopping to continuously fill the space where an exterior wall of composite type construction passes a perimeter structural member, such as a girder, beam, or strut, and the finish on the interior wall face does not continue up to close with the underside of the structural floor above, thus interrupting the fire-resistive integrity of the wall system, and a space remains open between the interior face of wall and lower edge of the structural member.
- D. Interior Walls and Partitions:
1. Where a wall or partition is continuous past a structural floor, such as stairwells and vertical shafts, and a space would otherwise remain open between the wall face and perimeter edge of the adjoining structural floor, provide fire stopping.
    - a. Provide firestopping system regardless of any clips, angles, plates, or other members bridging or interconnecting the facing and floor system, whether or not such items are continuous.
  2. Provide firestopping where the top edge of a fire-rated wall or partition abuts and is at right angles to fluted type metal deck, and the construction is such that the flute spaces remain open.
  3. Provide firestopping at construction joints between top of fire rated walls and underside of floor and/or roof above.
    - a. Firestop system shall allow for deflection of floor/roof above.
- E. Provide firestopping to fill miscellaneous voids and openings in fire-rated construction in manner essentially the same as specified herein before.

### 3.03 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Surface Cleaning: Clean out penetrations, openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
  1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
  2. Clean opening and joint substrates and penetrating items to produce clean, sound, and dry surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
  3. Remove laitance and form release agents from concrete.
  4. Remove incompatible materials that could adversely affect bond.

- C. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- D. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing the firestoppings seal with substrates.
- E. Install backing materials to prevent liquid material from leakage.

### **3.04 INSTALLATION, GENERAL**

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- C. Install labeling required by code.

### **3.05 INSTALLATION OF SAFING INSULATION**

- A. Install safing as recommended by manufacturer and as acceptable to Fire Marshal.
- B. Install safing insulation to fill gap between edges of walls or floors and back of other construction on safing clips spaced as needed to support insulation but not further apart than 24 inches o.c. Make sure to orient grain of insulation in accordance with tested firestopping assembly. Cut safing insulation wider than gap to be filled to ensure compression fit and seal joint between insulation and edge of construction. Follow tested assembly for amount of compression required. Leave no voids in completed installation.
- C. Do not tear or rip insulation. Cut insulation with a knife.

### **3.06 INSTALLATION - FORMING, PACKING, OR BACKING MATERIALS**

- A. Install forming, packing, or backing materials in accordance with manufacturer's instructions to come in contact with and adhere to penetrating item and substrate, to support fill materials during their application and in position required to produce cross-sectional shapes and depths required to maintain fire assemblies per UL listing.
- B. Remove or leave in place in accordance with UL system.

### **3.07 INSTALLATION - FILL, VOID OR CAVITY MATERIALS**

- A. Install fill, void, or cavity materials in accordance with manufacturer's instructions, to come in contact with, and adhere to substrates to maintain fire separations per UL listing.
- B. For fill materials exposed to view, finish to a smooth, uniform surface flush with adjacent construction.

### **3.08 INSTALLATION - FIRESTOP SEALANT OR SEALER**

- A. Install in accordance with manufacturer's instructions, to maintain fire separations per UL listing.
- B. Tool firestopping sealant or sealer to maintain structural integrity of installed assembly.

### **3.09 INSTALLATION - OTHER COMPONENTS**

- A. Install other components, like cover plates, retainers, fitting, etc., in accordance with manufacturer's instructions, to maintain fire separations, per UL listing.

### **3.10 RESPONSIBILITY**

- A. Contractor is responsible to select a system, or combination of systems which, when installed, will maintain required fire separation between building elements.
- B. System must provide the fire (F) rating, temperature (T) rating and/or air leakage rating (L) as required by applicable codes.
- C. Perform patching and repair of firestopping systems damaged by other trades.



### **3.11 FIELD QUALITY CONTROL**

- A. Keep areas of firestopping work accessible and notify authorities having jurisdiction, or other designated inspectors, of work completion and ready for final inspection.
  - 1. Do not conceal firestopping installations behind other construction until authorities having jurisdiction have examined each installation.
  - 2. If deficiencies are found, repair, or replace fire resistive joint to comply with system requirements and authorities having jurisdiction.
- B. At completion of firestopping work at each location, provide labels stating the following:
  - 1. Identification shall be located in accessible concealed floor, floor-ceiling or attic spaces, for perimeter joints including top of wall, floor to wall, bottom of wall, wall to wall joints and as follows:
    - a. Locate: Within 15 feet of the end of each wall and at intervals not exceeding 30 feet measured horizontally along wall or partition.
    - b. Lettering: Not less than 3 inches in height with a minimum stroke width of 3/8 inches. Use a color that contrasts with the substrate and incorporate the same rating/designation as indicated on drawings and include the suggested wording "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS". Include the following:
      - 1) Manufacturer's Name and Product
      - 2) UL Classified System Design Number, Warnock Hersey/Intertek number or Engineering judgement identifier as applicable to specific firestopping system.
  - 2. At all penetrations indicate the following:
    - Manufacturer's Name and Product
    - UL Classified System Design Number, Warnock Hersey/Intertek number or Engineering judgement identifier as applicable to specific firestopping system.

### **3.12 CLEANING**

- A. Clean adjacent surfaces of firestopping materials.

### **3.13 PROTECTION**

- A. Protect adjacent surfaces from damage by material installation.

### **END OF SECTION**

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## **SECTION 07 9200 - JOINT SEALANTS**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Nonsag gunnable joint sealants.
- B. Joint backings and accessories.

#### **1.03 REFERENCE STANDARDS**

- A. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants 2018 (Reapproved 2022).
- B. ASTM C834 - Standard Specification for Latex Sealants 2017.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
- D. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems 2016.
- E. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- F. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants 2022.
- G. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints 2019 (Reapproved 2020).

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, with indication where each product is being used, that includes the following.
  - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
  - 2. List of backing materials approved for use with the specific product.
  - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
  - 4. Substrates the product should not be used on.
  - 5. Substrates for which use of primer is required.
- C. Samples: Manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- D. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- E. Installation Plan: Submit at least four weeks prior to start of installation.
- F. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.
- G. Installation Log: Submit filled out log for each length or instance of sealant installed.

#### **1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing the work of this section and with at least five years of documented experience and approved by manufacturer.
- B. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
  - 1. Adhesion Testing: In accordance with ASTM C794.
  - 2. Compatibility Testing: In accordance with ASTM C1087.
  - 3. Stain Testing: In accordance with ASTM C1248.
  - 4. Allow sufficient time for testing to avoid delaying the work.

5. Deliver to manufacturer sufficient samples for testing.
  6. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
  7. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.
- C. Installation Plan: Include schedule of sealed joints, including the following.
1. Joint width indicated in Contract Documents.
  2. Joint depth indicated in Contract Documents; to face of backing material at centerline of joint.
  3. Method to be used to protect adjacent surfaces from sealant droppings and smears, with acknowledgement that some surfaces cannot be cleaned to like-new condition and therefore prevention is imperative.
  4. Approximate date of installation, for evaluation of thermal movement influence.
  5. Installation Log Form: Include the following data fields, with known information filled out.
    - a. Unique identification of each length or instance of sealant installed.
    - b. Location on project.
    - c. Substrates.
    - d. Sealant used.
    - e. Stated movement capability of sealant.
    - f. Primer to be used, or indicate as "No primer" used.
    - g. Size and actual backing material used.
    - h. Date of installation.
    - i. Name of installer.
    - j. Actual joint width; provide space to indicate maximum and minimum width.
    - k. Actual joint depth to face of backing material at centerline of joint.
    - l. Air temperature.
- D. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
1. Name(s) of sealant manufacturers' field representatives who will be observing
- E. Field Adhesion Test Procedures:
1. Allow sealants to fully cure as recommended by manufacturer before testing.
  2. Have a copy of the test method document available during tests.
  3. Take photographs or make video records of each test, with joint identification provided in the photos/videos; for example, provide small erasable whiteboard positioned next to joint.
  4. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
  5. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
  6. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
  7. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.
- F. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
1. Sample: At least 18 inches long.
  2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.
  3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.
  4. Record results on Field Quality Control Log.

5. Repair failed portions of joints.

## **1.06 PROJECT CONDITIONS**

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.
- B. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 degF.
  - 2. When joint substrates are wet due to rain, frost, condensation or other causes.
- C. Joint Width Conditions: Do not proceed with installation of joint sealant when joint widths are less than allowed by joint sealant manufacturer for application indicated.
- D. Joint Substrate Conditions: Do not proceed with installation of joint sealant until contaminants capable of interfering with their adhesion are removed from joint substrates.

## **PART 2 PRODUCTS**

### **2.01 JOINT SEALANT APPLICATIONS**

- A. Scope:
  - 1. Interior Joints: Interior joints to be sealed include, but are not limited to, the following items.
    - a. Joints between door, window, and other frames and adjacent construction.
    - b. Control and expansion joints.
    - c. Plumbing fixtures.
    - d. Countertops.
    - e. Equipment.
    - f. Joints in flooring materials, as indicated and required.
    - g. Isolation joints between structure and other elements.
    - h. Acoustic and other types of separation joints.
    - i. Other joints indicated.
  - 2. Do not seal the following types of joints.
    - a. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
    - b. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
    - c. Joints where installation of sealant is specified in another section.
    - d. Joints between suspended panel ceilings/grid and walls.
    - e. Weep holes in window, storefront or curtainwall systems.
    - f. Vents in soffits, masonry, and other locations indicated to allow water to escape building envelope.
    - g. Joints in rainscreen facades.
    - h. Weep holes in metal panel systems.
- B. Interior Joints: Use paintable non-sag polyurethane sealant, unless otherwise indicated.
  - 1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
  - 2. Wall and Ceiling Joints in Wet Areas: Non-sag polyurethane sealant.
  - 3. Floor Joints in Wet Areas: Non-sag polyurethane "non-traffic-grade" sealant suitable for continuous liquid immersion.
  - 4. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant (Not for use at aluminum); Where substrate is tile, refer to 09 3000 - Tiling for sealant to match grout.
  - 5. Narrow Control Joints in Interior Concrete Slabs: Self-leveling epoxy sealant.
  - 6. Other Floor Joints: Self-leveling polyurethane "traffic-grade" sealant.
- C. Interior Wet Areas are defined as: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

## 2.02 JOINT SEALANTS - GENERAL

- A. Colors: As selected by Architect from manufacturer's full range, including special order and CUSTOM colors.
  - 1. Architect may select multiple colors to match adjacent building components.

## 2.03 NONSAG JOINT SEALANTS

- A. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, acid-curing, mildew resistant; not expected to withstand continuous water immersion or traffic.
  - 1. Manufacturers:
    - a. Dow Corning Corporation; 786 Silicone Mildew Resistant Sealant: [www.dowcorning.com](http://www.dowcorning.com).
    - b. Tremco Global Sealants; Tremsil 200: [www.tremcosealants.com](http://www.tremcosealants.com).
    - c. Franklin International; Titebond 100% Silicone Sealant: [www.titebond.com](http://www.titebond.com)
    - d. Pecora Corporation; 898NST Sanitary Mildew Resistant Silicone Sealant: [www.pecora.com](http://www.pecora.com).
    - e. GE; SCS 1700 Sanitary
- B. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
  - 1. Movement Capability: Plus and minus 50 percent, minimum.
  - 2. Manufacturers:
    - a. Pecora Corporation DynaTrol II General Purpose Two Part Polyurethane Sealant: [www.pecora.com](http://www.pecora.com).
    - b. Sika Corporation; Sikaflex-2c NS: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
    - c. Tremco Commercial Sealants & Waterproofing; Dymonic 100: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
- C. Acrylic Emulsion Latex: Water-based; ASTM C920, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
  - 1. Movement Capability: Plus and minus 25 percent, minimum.
  - 2. Manufacturers:
    - a. Franklin International, Inc; Titebond GREENchoice Acoustical Smoke & Sound Sealant: [www.titebond.com/#sle](http://www.titebond.com/#sle).
    - b. Owens Corning; Quiet Zone Acoustic Sealant
    - c. Pecora Corporation; AVW-920 Acrylic Latex: [www.pecora.com](http://www.pecora.com).
    - d. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: Clear only [www.sherwin-williams.com](http://www.sherwin-williams.com).

## 2.04 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
  - 1. Open Cell: 40 to 50 percent larger in diameter than joint width.
  - 2. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
- B. Bond Breaker Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that joints are ready to receive work.

- B. Verify that backing materials and release tapes are compatible with sealants.
- C. Verify that backer rods are of the correct size.
- D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
  - 1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
  - 2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
  - 3. Arrange for sealant manufacturer's technical representative to be present during tests.
  - 4. Record each test on Preinstallation Adhesion Test Log as indicated.
  - 5. If any sample fails, review products and installation procedures, consult manufacturer, or take whatever other measures are necessary to ensure adhesion; re-test in a different location; if unable to obtain satisfactory adhesion, report to Architect.
  - 6. After completion of tests, remove remaining sample material and prepare joint for new sealant installation.

### **3.02 PREPARATION**

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturers and the following requirements:
  - 1. Remove all foreign material from joint substrates which 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; oil; grease; water; and surface dirt.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous surfaces include, but are not limited to, the following:
    - a. Concrete.
    - b. Masonry.
    - c. Unglazed ceramic tile.
  - 3. Clean nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealants. Non-porous surfaces include, but are not limited to, the following:
    - a. Metal.
    - b. Glass.
    - c. Glazed surfaces of ceramic tile.
  - 4. Remove laitance and form-release agents from concrete.
- B. Joint Priming: Prime joint substrates where indicated or recommended by joint sealant manufacturer and based on preconstruction testing. Confine primers to areas of joint sealant bond; do not allow spillage or migration to other surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be stained or damaged by such contact or by cleaning methods to remove smears. Remove tape immediately after tooling joint sealant.
- D. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- E. Protect elements surrounding the work of this section from damage or disfigurement.

### **3.03 INSTALLATION**

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

- D. Support sealant from back with backer rod, bond breaker tape, or as recommended by manufacturer.
  - 1. Install joint backing of type indicated to support sealants during application and at position to allow optimum sealant joint geometry and optimum sealant movement capability.
    - a. Do not stretch, twist, puncture, or tear joint backing. Do not leave gaps between ends of joint backing pieces.
- E. Install bond breaker backing tape where backer rod cannot be used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
  - 1. Place sealants in manner to directly contact and fully wet joint substrates.
  - 2. Completely fill recesses provided for each joint configuration.
  - 3. Place uniform, cross sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- H. Nonsag Sealants: Immediately after sealant application and prior to the time skinning or curing begins, tool surface concave, unless otherwise indicated, to form smooth, uniform beads, eliminating air pockets and ensuring contact and adhesion of sealant with sides of joint; remove masking tape immediately after tooling sealant surface.

#### **3.04 FIELD QUALITY CONTROL**

- A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

#### **3.05 CLEANING**

- A. Clean off excess sealant or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealant and of products in which joints occur.

#### **3.06 PROTECTION**

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so they are without deterioration or damage at time of substantial completion.
  - 1. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealant immediately and reseal joints with new materials so repaired areas are indistinguishable from original work.

#### **3.07 POST-OCCUPANCY**

- A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width; i.e. at low temperature in thermal cycle. Report failures immediately and repair.

#### **END OF SECTION**



## **SECTION 08 0671 - DOOR HARDWARE SCHEDULE**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Preliminary schedule of door hardware sets for swinging as indicated on drawings.

#### **1.03 REFERENCE STANDARDS**

- A. BHMA A156.18 - Materials and Finishes 2020.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.  
B. Comply with submittal requirements as indicated in Section 08 7100 - Door Hardware.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Only manufacturers listed in Door Hardware Schedule or Section 08 7100 - Door Hardware are considered acceptable, unless noted otherwise.  
B. Obtain each type of door hardware as indicated from a single manufacturer and single supplier.  
C. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.  
D. Manufacturer's Abbreviations: Coordinate with manufacturers listed in Section 08 7100 - Door Hardware.

#### **2.02 DESCRIPTION**

- A. Door hardware sets provided represent the design intent, they are only a guideline and should not be considered a detailed or complete hardware schedule.  
1. Provide door hardware item(s) as required for similar purposes, even when item is not listed for a door in Door Hardware Schedule.  
2. Necessary items that are not included in a Hardware Set should be added and have the appropriate additional hardware as required for proper application and functionality.  
3. Door hardware supplier is responsible for providing proper size and hand of door for products required in accordance with Door Hardware Schedule and as indicated on drawings.

#### **2.03 FINISHES**

- A. Finishes: Complying with BHMA A156.18.

### **PART 3 EXECUTION**

#### **3.01 DOOR HARDWARE SCHEDULE**

#### **3.02 HARDWARE SET # 1: - NOT USED**

#### **3.03 HARDWARE SET # 2:**

<u>QTY</u>	<u>EA</u>	<u>ITEM</u>	<u>MODEL NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGES	5BB1HW	652	IVE
1	EA	CYLINDRICAL LOCKSET	9K 7L 15D S3	626	DOR
1	EA	WALL BUMPER	WS 406/407 CCV	626	SCH
1	EA	MOP PLATE	8400 6" HIGH	630	IVE

### 3.04 HARDWARE SET # 3: DEMOUNTABLE PARTITION DOORS

<u>QTY</u>	<u>EA</u>	<u>ITEM</u>	<u>MODEL NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
4	EA	HINGES	5BB1	652	IVE
1	EA	LOCKSET	9K 7D 15D	626	DOR
1	EA	ELECTRIC STRIKE	6215	630	VON
1	EA	DOOR POSITION SWITCH	7769	-	SCH
1	EA	WALL BUMPER	WS 406/407 CCV	626	IVE
1	EA	CREDENTIAL READER	BY OWNERS SECURITY VENDOR	-	-
1	EA	POWER SUPPLY	BY OWNERS SECURITY VENDOR	-	-

### 3.05 HARDWARE SET # 4:

<u>QTY</u>	<u>EA</u>	<u>ITEM</u>	<u>MODEL NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGES	5BB1	652	IVE
1	EA	FIRE EXIT DEVICE	98 L F	626	VON
1	EA	CYLINDER	SFIC	626	BES
1	EA	CLOSER	4040XP	626	LCN
1	SET	SMOKE SEALS	5050	BLK	NGP

END OF SECTION

## **SECTION 08 1113 - HOLLOW METAL DOORS AND FRAMES**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Non-fire rated Hollow metal frames for wood doors.
- B. Fire-rated hollow metal doors and frames.

#### **1.03 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- B. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames 2022.
- C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2022.
- D. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames 2020.
- E. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.
- F. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2020.
- G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable 2021a.
- I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
- J. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- K. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames 2016.
- L. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames 2006.
- M. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames 2004.
- N. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
- O. ITS (DIR) - Directory of Listed Products Current Edition.
- P. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames 2002.
- Q. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames 2011.
- R. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames 2017.
- S. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames 2014.
- T. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2022.
- U. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2022.
- V. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.
- W. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames 2023.
- X. UL (DIR) - Online Certifications Directory Current Edition.

- Y. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.
- Z. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's specifications for fabrication and installation, including data substantiating products comply with requirements. Include materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- C. Shop Drawings: For fabrication and installation of steel door and frame work. Indicate details of each frame type, elevation of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
- D. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
  - 1. Indicate coordination of glazing frames and stops with glass and glazing requirements.
- E. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

#### **1.05 QUALITY ASSURANCE**

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- D. Maintain at project site copies of reference standards relating to installation of products specified.
- E. Pre-Installation Conference: Conduct conference in compliance with requirements in Division 01 with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.
- C. Inspect steel door and frame work upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise remove and replace damaged item as directed.
- D. Store doors and frames at the building site under cover. Place units on minimum 4-inch high wood blocking. Avoid use of non-vented plastic or canvas shelters, which could create a humidity chamber. If cardboard wrappers on doors become wet, remove carton immediately. Provide 1/4-inch spaces between stacked doors to promote air circulation.

#### **1.07 PROJECT CONDITIONS**

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

## 1.08 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Hollow Metal Frames:
1. Ceco Door, an Assa Abloy Group company: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
  2. Curries, an Assa Abloy Group company: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
  3. Mesker, dormakaba Group: [www.meskeropeningsgroup.com/#sle](http://www.meskeropeningsgroup.com/#sle).
  4. Republic Doors, an Allegion brand: [www.republicdoor.com/#sle](http://www.republicdoor.com/#sle).
  5. Steelcraft, an Allegion brand: [www.allegion.com/#sle](http://www.allegion.com/#sle).
  6. Substitutions: Refer to Section 01 1000 - Summery.

### 2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Frames:
1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
  2. Accessibility: Comply with ICC A117.1 and ADA Standards.
  3. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 and ANSI/SDI A250.6 in accordance with specified requirements.
    - a. Reinforce hollow metal units to receive surface-applied hardware in conformance with ANSI/SDI A250.6. Drilling and tapping for surface-applied hardware may be done at Project site.
    - b. Locate finish hardware as shown on final shop drawings, or if not shown, in accordance with the DHI (LOCS).
    - c. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Section 08 7100 - Door Hardware.
    - d. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
    - e. Conduit: Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.
  4. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvanized) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

### 2.03 HOLLOW METAL DOORS

- A. Door Finish: Factory primed and field finished.
- B. Fire-Rated Doors:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    - a. Level 1 - Standard-duty.
    - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
    - c. Model 1 - Full Flush.
    - d. Interior Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
  2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").

- a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
- b. Attach metal or mylar fire rating label to each fire rated unit.
- c. Smoke and Draft Control Doors(All fire doors are smoke and draft control doors):  
Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
  - 1) Maximum Air Leakage: 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
  - 2) Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
  - 3) Label: Include the "S" label on fire-rating label of door.
3. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
4. Door Thickness: 1-3/4 inch, nominal.

#### **2.04 HOLLOW METAL FRAMES**

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Frame Finish: Factory primed and field finished.
- C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
  1. Frame Metal Thickness:
    - a. Openings up to and including 4'-0": 16 gage, 0.053 inch
    - b. Openings greater than 4'-0": 14 gage, 0.067 inch
- D. Door Frames, Fire-Rated: Full profile/continuously welded type.
  1. Fire Rating: Same as door. Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
  2. Frame Metal Thickness:
    - a. Openings up to and including 4'-0": 16 gage, 0.053 inch
  3. Acoustic Insulation: Where frames are in walls indicated to receive acoustic batt insulation, fill frame with unfaced fiberglass or mineral wool batt insulation complying with ASTM C665.
- E. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

#### **2.05 FINISHES**

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

#### **2.06 ACCESSORIES**

- A. Glazing: As specified in Section 08 8000 - Glazing.
- B. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
- C. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions. Install plastic plugs to keep holes clean during construction.
  1. Provide supply of manufacturer's standard rubber silencers in quantity not less than twice required for project.
  2. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
- D. Temporary Frame Spreaders: Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates and conditions under which steelframe work is to be installed. Notify General Contractor in writing of conditions detrimental to proper and timely completion of work.
- B. Verify existing conditions before starting work.
- C. Verify that opening sizes and tolerances are acceptable.
- D. Verify that finished walls are in plane to ensure proper door alignment.
- E. Do not proceed with work until unsatisfactory conditions have been corrected in an acceptable manner.

### **3.02 INSTALLATION**

- A. Install frames in accordance with shop drawings, manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Placing Frames: Comply with ANSI/SDI A250.11, BHMA A156.115 and BHMA A156.115W, unless otherwise indicated. Set frames accurately in position, plumbed, aligned and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
  - 1. In metal-stud partitions, install minimum 3 anchors per jamb at hinge and strike levels. In steel-stud partitions, attach anchors to studs with screws.
- C. Door Installation: Fit steel doors accurately in frames, within clearances specified in ANSI/SDI A250.8.
  - 1. Non-Fire-Rated Doors: Fit non-fire-rated steel doors accurately in their respective frames with the following clearances:
    - a. Jambs and Head: 3/32 inch.
    - b. Meeting Edges, Pairs of Doors: 1/8 inch.
    - c. Bottom: 5/8 inch where no threshold or carpet; 1/8 inch at threshold or carpet.
  - 2. Fire-Rated Doors: Install with clearances specified in NFPA 80.
  - 3. Smoke-Control Doors: Comply with NFPA 105.
- D. Install fire rated units in accordance with NFPA 80.
- E. Coordinate frame anchor placement with wall construction.
- F. Install door hardware as specified in Section 08 7100.
  - 1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 and NAAMM HMMA 861.
- G. Comply with glazing installation requirements of Section 08 8000 and with hollow metal manufacturer's written instructions.
- H. Coordinate installation of electrical connections to electrical hardware items.

### **3.03 TOLERANCES**

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 and NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

### **3.04 ADJUSTING**

- A. Adjust for smooth and balanced door movement.
- B. Final Adjustments: Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames warped, bowed or otherwise unacceptable.
- C. Prime Coat Touch-Up: Immediately after erection, sand smoothly any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

## **END OF SECTION**

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## **SECTION 08 1416 - FLUSH WOOD DOORS**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.
- B. Flush wood doors; flush configuration; non-rated.

#### **1.02 REFERENCE STANDARDS**

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition 2014, with Errata (2016).
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards 2021, with Errata.
- C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2022.

#### **1.03 SUBMITTALS**

- A. Product Data: Provide manufacturer's technical data for each type of door including details of core and edge construction, trim for openings and factory-finishing specifications.
  - 1. For factory machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.
  - 2. Show veneer leaves with dimensions, grain direction, exposed face, and an identification number indicated on each leaf. Identification number shall indicate the flitch and the sequence within the flitch for each leaf.
- B. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing, fire rating, requirements for veneer matching and other details.
- C. Samples: Submit two samples of door veneer, 12 by 12 inches in size illustrating wood grain, stain color, and sheen.
- D. Warranty, executed in Owner's name.

#### **1.04 COORDINATION**

- A. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the wood door supplier in order to prepare the doors and frames to receive the finish hardware items.
- B. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for doors, frames and hardware, using temporary, removable or concealed markings.

#### **1.05 WARRANTY**

- A. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.
  - 1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.
  - 2. Warranty shall also include reinstallation which may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Wood Veneer Faced Doors: Subject to compliance with requirements, provide doors by one of the following:
  - 1. Krieger Specialty Products: [www.kriegerproducts.com/#sle](http://www.kriegerproducts.com/#sle).
  - 2. Masonite Architectural Door Systems
  - 3. VT Industries, Inc: [www.vtindustries.com/#sle](http://www.vtindustries.com/#sle).

#### **2.02 DOORS**

- A. Doors: See drawings for locations and additional requirements.

1. Quality Standard: Premium Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
  2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
1. Provide solid core doors at all locations.
  2. Wood veneer facing for field opaque finish as indicated on drawings.

### **2.03 DOOR AND PANEL CORES**

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

### **2.04 DOOR FACINGS**

- A. Veneer Facing for Opaque Finish: Medium density overlay (MDO), in compliance with indicated quality standard.
- B. Facing Adhesive: Type II - water resistant.
- C. Comply with veneer and finish requirements of Section 06 4023 - Interior Architectural Woodwork.

### **2.05 DOOR CONSTRUCTION**

- A. Fabricate doors in accordance with door quality standard specified and job-site fitting requirements.
- B. Blocking: Provide composite blocking designed to maintain fire resistance of door, but with improved screw holding capabilities of same thickness as core and of the following minimum dimensions:
1. Top Rail: 5 inches.
  2. Bottom Rail: 5 inches.
  3. Lock Block: 5 inches by 18 inches.
  4. Mid Rail: 5 inches.
- C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard. Comply with requirements of NFPA 80 for fire rated doors
- E. Provide edge clearances in accordance with the quality standard specified.
- F. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.
- G. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of doors required.
1. Light Openings: Trim openings with moldings of material and profiles specified.

### **2.06 FINISHES - WOOD VENEER DOORS**

- A. Refer to 09 9100 - PAINTING for field finishing.

### **2.07 ACCESSORIES**

- A. Hollow Metal Door Frames: As specified in Section 08 1113 - Hollow Metal Doors and Frames.
- B. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

- C. Job-Fit 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 with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
  - 1. Fitting Clearances for Non-Rated Doors: Provide 1/8 inch at jambs and heads, 1/16 inch per leaf at meeting stile for pairs of doors; and 1/8 inch from bottom of door to top of decorative floor finish or covering.
  - 2. Bevel non-rated doors 1/8 inch in 2 inches at lock and hinge edges.
- D. Use machine tools to cut or drill for hardware.
- E. Coordinate installation of doors with installation of frames and hardware.
- F. Coordinate installation of glazing.
- G. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

### **3.02 TOLERANCES**

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

### **3.03 ADJUSTING**

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.
- C. Operation: Rehang or replace doors which do not swing or operate freely.

### **3.04 CLEANING AND PROTECTION**

- A. Finished Doors: Replace doors damaged during installation.
- B. Protect doors as recommended by door manufacturer to ensure wood doors will be without damage or deterioration at time of Substantial Completion.

### **END OF SECTION**

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## **SECTION 08 7100 - DOOR HARDWARE**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Hardware for wood, aluminum, and hollow metal doors.
- B. Hardware for fire-rated doors.
- C. Electrically operated and controlled hardware.
- D. Weatherstripping and gasketing.

#### **1.03 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- B. BHMA A156.1 - Standard for Butts and Hinges 2021.
- C. BHMA A156.2 - Bored and Preamsembled Locks and Latches 2017.
- D. BHMA A156.3 - Exit Devices 2020.
- E. BHMA A156.4 - Door Controls - Closers 2019.
- F. BHMA A156.5 - Cylinders and Input Devices for Locks 2020.
- G. BHMA A156.16 - Auxiliary Hardware 2018.
- H. BHMA A156.22 - Standard for Gasketing 2021.
- I. BHMA A156.31 - Electric Strikes and Frame Mounted Actuators 2019.
- J. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames 2016.
- K. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames 2006.
- L. DHI (H&S) - Sequence and Format for the Hardware Schedule 2019.
- M. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
- N. ITS (DIR) - Directory of Listed Products Current Edition.
- O. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- P. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2022.
- Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.
- R. UL (DIR) - Online Certifications Directory Current Edition.
- S. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- C. Preinstallation Meeting: Convene a preinstallation meeting at least two weeks prior to commencing work of this section; attendance is required by affected installers and the following:
  - 1. Owner
  - 2. Architect.
  - 3. General Contractor
  - 4. Installer's Architectural Hardware Consultant (AHC).

5. Hardware Installer.
6. Owner's Security and Access Control Consultant.
- D. Agenda:
  1. Review installation of hardware; specifically that of locksets, closers, exit devices, overhead stops and coordinators. Manufacturer's representatives of the above products, in conjunction with the hardware supplier for the project, shall present the seminar. Seminar to be held at job site and attended by installers of hardware for aluminum, hollow metal and wood doors. Seminar to address proper coordination and installation of hardware, per finish hardware schedule for this specific project, by using installation manuals, hardware schedule, templates, physical product samples and installation videos.
  2. When any electrical or pneumatic hardware is specified this meeting shall also include the following trades/installers: Electrical, Security, Alarm systems and Independent (Design) Contractor.
  3. The Hardware Supplier shall include the cost of this seminar in his proposal.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
- F. Deliver established keying requirements to manufacturers.
- G. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

#### 1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
  1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
  2. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
    - a. Submit in vertical format, refer to Section 08 0671. "Horizontal" schedules will be returned "Not Approved."
  3. Provide a preface sheet listing category only and manufacturer's names of items being furnished as follows:

CATEGORY	SPECIFIED	SCHEDULED
Hinges	Manufacturer A	Manufacturer B
Lock sets	Manufacturer X	Manufacturer X
Kick Plates	Open	Manufacturer Z

4. List groups and suffixes in proper sequence.
5. Provide complete description for each door listed.
6. Provide manufacturer's and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
7. Include account of abbreviations and symbols used in schedule.
8. 8-1/2 x 11 inch sheets
9. U.S. Standard Finish symbols or BHMA Finish symbols.
- D. Shop Drawings - Electrified Door Hardware: Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified or pneumatically controlled door opening as follows:
  1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).

2. Elevations: Submit front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
  3. Diagrams: Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.
- E. Samples for Verification:
1. Prior to submittal of the final hardware schedule and prior to final ordering of finish hardware, submit 1 sample of each type of exposed hardware unit illustrating style, color, and finish and tagged with full description for coordination with schedule.
  2. Samples will be returned to supplier. Units, which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.
- F. Submit to General Contractor/Construction Manager, the factory order acknowledgement numbers for the various hardware items to be used on the project. The factory order acknowledgement numbers shall help to facilitate and expedite any service that may be required on a particular hardware item. General Contractor/Construction Manager shall keep these order acknowledgement numbers on file in the construction trailer.
- G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- H. Keying Schedule:
1. Submit detailed schedule indicating clearly how the Owner's final keying instructions have been followed for approval of Owner.
    - a. Submit schedule separate from hardware schedule.
- I. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
- J. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
1. Extra Lock Cylinders: One for each master keyed group.
  2. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

## **1.06 QUALITY ASSURANCE**

- A. Supplier Qualifications
1. Qualifications for hardware supplier: Supplier must have adequate inventory, qualified personnel on staff and be located within 100 miles of the project. The distributor must be a factory-authorized dealer for all materials required. Company with certified Architectural Hardware Consultant (AHC) to assist in work of this section.
  2. Qualifications for electrified hardware supplier: Shall be an experienced door hardware supplier who has completed projects with electrified door hardware similar in material, design, and extent to that indicated for this project, whose work has resulted in construction with a record of successful in-service performance, and who is acceptable to manufacturer of primary materials.
    - a. Shall prepare data for electrified door hardware, including shop drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this project.
    - b. Shall have experience in providing consulting services for electrified door hardware installations.

## **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

## 1.08 WARRANTY

- A. All items, except as noted below, shall be warranted in writing by the manufacturer against failure due to defective materials and workmanship for a minimum period of one (1) year commencing on the date of final completion and acceptance. In the event of product failure, promptly repair or replace item with no additional cost to the owner.
  - 1. Closers: Ten years, minimum.
  - 2. Exit Devices: Five years, minimum.
  - 3. Locksets:
    - a. Mortise: Seven years, minimum.
  - 4. Balance of items shall carry a manufacturer's 1-year warranty against manufacturing defects and workmanship.
- B. During the warranty period, replace defective work, including labor, materials and other costs incidental to the work. Inspect the work within 24 hours after receipt of notice from the Owner. Replace work found to be defective as defined in the General Conditions.

## PART 2 PRODUCTS

### 2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Provide door hardware products that comply with the following requirements:
  - 1. Applicable provisions of federal, state, and local codes.
  - 2. Accessibility: ADA Standards and ICC A117.1.
  - 3. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
  - 4. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
  - 5. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
  - 6. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
  - 7. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.
- D. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.
- E. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. Refer to Section 08 0671 for listing of hardware sets.
- F. Fasteners:
  - 1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
    - a. Aluminum fasteners are not permitted.
    - b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
  - 2. Thru-bolts/ sex bolts are NOT permitted. Coordinate with provision of doors to located blocking in required locations for hardware being provided.
  - 3. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
    - a. Self-drilling (Tek) type screws are not permitted.
  - 4. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
  - 5. Fire-Rated Applications: Comply with NFPA 80.
    - a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.



- b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

## **2.02 HINGES**

- A. Manufacturers:
  - 1. McKinney; an Assa Abloy Group company: [www.assaabloydss.com](http://www.assaabloydss.com).
  - 2. Bommer Industries, Inc: [www.bommer.com](http://www.bommer.com).
  - 3. Hager Companies: [www.hagerco.com/#sle](http://www.hagerco.com/#sle).
  - 4. Ives, an Allegion Brand:
  - 5. Stanley, dormakaba Group: [www.stanleyhardwarefordoors.com/#sle](http://www.stanleyhardwarefordoors.com/#sle).
- B. Hinges: Comply with BHMA A156.1, Grade 1.
  - 1. Provide hinges on every swinging door.
  - 2. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
  - 3. Provide ball-bearing hinges at each door with closer.
  - 4. Provide non-removable pins on exterior outswinging doors.
  - 5. Provide following quantity of butt hinges for each door:
    - a. Doors From 60 inches High up to 90 inches High: Three hinges.
    - b. Doors 90 inches High up to 120 inches High: Four hinges.
  - 6. Size of Hinges:
    - a. Door Thickness: 1-3/4 inches
      - 1) Door Width: up to and including 36 inches: 4.5 x 4.5 inch hinges.
      - 2) Door Width greater than 36 inches up to 48 inches: 5.0 x 4.5 inch hinges.

## **2.03 EXIT DEVICES**

- A. Manufacturers:
  - 1. Von Duprin, an Allegion brand: [www.allegion.com/us](http://www.allegion.com/us).
- B. Exit Devices: Comply with BHMA A156.3, Grade 1.
  - 1. Lever design to match lockset trim.
  - 2. Provide cylinder with cylinder dogging or locking trim.
  - 3. Provide exit devices properly sized for door width and height.
  - 4. Provide strike as recommended by manufacturer for application indicated.
  - 5. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.

## **2.04 ELECTRIC STRIKES**

- A. Manufacturers:
  - 1. Von Duprin, an Allegion Brand
- B. Electric Strikes: Comply with BHMA A156.31, Grade 1.
  - 1. Provide UL (DIR) listed burglary-resistant electric strike; style to suit locks.

## **2.05 LOCK CYLINDERS**

- A. Manufacturers:
  - 1. Best, dormakaba Group: [www.bestaccess.com/#sle](http://www.bestaccess.com/#sle).
- B. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
  - 1. Provide small format interchangeable core (SFIC) type cylinders, Grade 1, with seven-pin core in compliance with BHMA A156.5 at locations indicated.
  - 2. Provide cylinders from same manufacturer as locking device.
  - 3. Provide cams and/or tailpieces as required for locking devices.
  - 4. Within specific Door Sections, when provisions for lock cylinder are being referenced to this Section, provide specified lock cylinder and keyed to building keying system, unless otherwise indicated.
  - 5. Final building cores supplied by contractor and installed by CMU Locksmith.

## **2.06 CYLINDRICAL LOCKS**

- A. Manufacturers:

1. Best, dormakaba Group; 9K: [www.bestaccess.com/#sle](http://www.bestaccess.com/#sle).
- B. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
  1. Bored Hole: 2-1/8 inch diameter.
  2. Latchbolt Throw: 1/2 inch, minimum.
  3. Backset: 2-3/4 inch unless otherwise indicated.
  4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
    - a. Finish: To match lock or latch.

## 2.07 CLOSERS

- A. Manufacturers; Surface Mounted:
  1. LCN, an Allegion brand: [www.allegion.com/us](http://www.allegion.com/us).
- B. Manufacturers; Concealed - Overhead:
  1. LCN, an Allegion brand: [www.allegion.com/us](http://www.allegion.com/us).
- C. Closers: Comply with BHMA A156.4, Grade 1.
  1. Type: As indicated in door hardware sets.
  2. Provide door closer on each exterior door.
  3. Provide door closer on each fire-rated and smoke-rated door.
    - a. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.
  4. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.
  5. At corridor entry doors, mount closer on room side of door.
  6. At outswinging exterior doors, mount closer on interior side of door.
  7. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder. Cylinder body shall be 1 1/2" in diameter, and double heat treated pinion shall be 11/16" in diameter with double D slab drive arm connection.
  8. Hydraulic fluid shall be of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
  9. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.
  10. All closers shall have solid forged steel main arms (and forged forearms for parallel arm closers).
  11. All surface mounted mechanical closers shall be certified to exceed ten million (10,000,000) full load cycles by a recognized independent testing laboratory.
  12. Closers will have Powder coating finish certified to exceed 100 hours salt spray testing by ETL, an independent testing laboratory used by BHMA for ANSI certification.
  13. Refer to door and frame details and furnish accessories such as drop plates, panel adapters, spacers and supports as required to correctly install door closers. State degree of door swing in the hardware schedule.

## 2.08 MOP PLATES

- A. Manufacturers:
  1. Hiawatha, Inc, an Activar Construction Products Group company: [www.activarcpg.com/hiawatha/#sle](http://www.activarcpg.com/hiawatha/#sle).
  2. Ives, an Allegion brand: [www.allegion.com/us/#sle](http://www.allegion.com/us/#sle).
  3. Trimco: [www.trimcohardware.com/#sle](http://www.trimcohardware.com/#sle).
  4. Pemko
- B. Mop Plates: Provide along bottom edge of push side of doors to provide protection from cleaning liquids and equipment damage to door surface.
  1. Size: 6 inch high by 1-1/2 inch less door width (LDW) on pull side and 2 inch LDW on push side of door.

## **2.09 WALL STOPS**

- A. Manufacturers:
  - 1. Rockwood; an Assa Abloy Group company: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
  - 2. Hager Companies: [www.hagerco.com/#sle](http://www.hagerco.com/#sle).
  - 3. Ives, an Allegion brand: [www.allegion.com/us](http://www.allegion.com/us).
  - 4. Trimco: [www.trimcohardware.com/#sle](http://www.trimcohardware.com/#sle).
- B. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
  - 1. Type: Bumper, convex, wall stop.
  - 2. Material: Brass housing with rubber insert.

## **2.10 WEATHERSTRIPPING AND GASKETING**

- A. Manufacturers:
  - 1. Pemko; an Assa Abloy Group company: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
  - 2. National Guard Products, Inc: [www.ngpinc.com/#sle](http://www.ngpinc.com/#sle).
  - 3. Zero International, Inc: [www.zerointernational.com/#sle](http://www.zerointernational.com/#sle).
- B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
  - 1. Head and Jamb Type: Self-adhesive.
  - 2. Provide gasketing for fire rated doors that comply with local codes, and requirements of assemblies complying with NFPA 80.
  - 3. Apply to head and jamb stops.
  - 4. Seals to prevent the passage of smoke as well as the passage of air, for use on rated and non-rated doors.
  - 5. On each door in smoke partition, provide smoke gaskets; top, sides, and meeting stile of pairs. If fire/smoke partitions are not indicated on drawings, provide smoke gaskets on each door identified as a "smoke door" and 20-minute rated fire doors.

## **2.11 FINISHES**

- A. Finishes: Identified in Section 08 0671 - Door Hardware Schedule.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available to power operated devices and of correct characteristics.

### **3.02 INSTALLATION**

- A. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.
- B. Use templates provided by hardware item manufacturer.
- C. Do not install surface mounted items until application of finishes to substrate are fully completed.
- D. Reinforced hollow metal doors and frames and reinforced aluminum door and frames will be drilled and tapped for machine screws.
- E. Solid wood doors and frames: full thread wood screws. Drill pilot holes before inserting screws.
- F. Install weather-strip gasket prior to parallel arm closer bracket, rim exit device or any stop mounted hardware. Gasket to provide a continuous seal around perimeter of door opening. Allow for gasket when installing finish hardware. Door closers will require special templating. Exit devices will require adjustment in backset.
- G. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.

<u>CATEGORY</u>	<u>DIMENSION</u>
Hinges	Door Manufacturer's Standard
Flush Bolt Levers	72 inches and 12 inches
Levers	Door Manufacturer's Standard
Exit Device Touchbar	Per Template
Push-Pull Units	42 inches to centerline of Pull
Offset Pulls	Suitable for Exit Devices
Push Plates	52 inches
Pull Plates	42 inches
Wall Stops / Holders	At Head
Astragals	Pull side of active leaf
Door Viewer	60 inches standard height; 43 inches ADA mounting height

- H. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

### **3.03 ADJUSTING**

- A. Adjust work under provisions of Section 01 7000 - Execution and Closeout Requirements.
- B. Adjust hardware for smooth operation.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.
- D. Locksets, closers and exit devices shall be inspected by the factory representative and adjusted after installation and after the HVAC system is in operation, to insure correct installation and proper adjustment in operation. The manufacturer's representative shall prepare a written report stating compliance, and also recording locations and kinds of noncompliance. The original report shall be forwarded to the Independent (Design) Contractor with copies to the Contractor, hardware distributor, hardware installer and building owner.

### **3.04 TECHNICAL AND WARRANTY INFORMATION:**

- A. At the completion of the project, the technical and warranty information coalesced and kept on file by the General Contractor/Construction Manager shall be given to the Owner or Owner's Agent. In addition to both the technical and warranty information, all factory order acknowledgement numbers supplied to the General Contractor/Construction Manager during the construction period shall be given to the Owner or Owner's Agent. The warranty information and factory order acknowledgement numbers shall serve to both expedite and properly execute any warranty work that may be required on the various hardware items supplied on the project.
- B. Submit to General Contractor/Construction Manager, two copies each of parts and service manuals and two each of any special installation or adjustment tools. Include for locksets, exit devices, door closers and any electrical products.

### **3.05 CLEANING**

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

### **3.06 PROTECTION**

- A. Do not permit adjacent work to damage hardware or finish.

### **END OF SECTION**

## **SECTION 08 8000 - GLAZING**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Glazing units.
- B. Glazing compounds.

#### **1.03 REFERENCE STANDARDS**

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials Current Edition.
- B. AAMA 800 - Voluntary Specifications and Test Methods for Sealants 2016.
- C. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test 2015 (Reaffirmed 2020).
- D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures Most Recent Edition Cited by Referring Code or Reference Standard.
- E. ASTM C719 - Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle) 2022.
- F. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers 2005 (Reapproved 2019).
- G. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
- H. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.
- I. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- J. ASTM C1281 - Standard Specification for Preformed Tape Sealants for Glazing Applications 2016.
- K. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings 2016.
- L. GANA (GM) - GANA Glazing Manual 2022.
- M. GANA (SM) - GANA Sealant Manual 2008.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene a preinstallation meeting two weeks before starting work of this section; require attendance by each of the affected installers, including but not limited to the following:
  - 1. Architect.
  - 2. General Contractor.
  - 3. Aluminum Entrance System Manufacturer.
  - 4. Aluminum Entrance System Installer.
  - 5. Glazed Window Wall Manufacturer.
  - 6. Glazed Window Wall Installer.
  - 7. Glazing Contractor.
  - 8. Sealant Manufacturer.
  - 9. Other interested parties.
- B. Review methods and procedures related to glazing in aluminum entrance systems and glazed window wall systems including, but not limited to, the following:
  - 1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
  - 2. Review structural loading limitations.

3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  4. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions.
  5. Review preparation and other requirements for installing structural sealant.
- C. General Contractor shall record discussion, including agreement or disagreement on significant matters. Furnish copies of report to all parties present within 5 days after meeting date.
1. If substantial disagreements exist at conclusion of meeting, determine how disagreements will be resolved, and set date and time to reconvene meeting.

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data on each type of glazing provided: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples 12 by 12 inch in size of each type of glazing indicated except for clear single pane glass.
- E. Samples: Submit 12 inch long bead of glazing sealant, of each color required (except black) for each type of sealant exposed to view. Install sealant samples between two strips of material representing adjoining framing in colors being supplied for project.
- F. Samples: Submit 12 inch square sample of laminated glass with polished edges.
- G. Certification: Submit written certification from respective manufacturers attesting glass and glazing materials furnished for project comply with requirements.
  1. Separate certification will not be required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authorities having jurisdiction.
  2. Certify secondary seals of insulated glass units are compatible with all glazing materials it will come in contact with (including structural silicone sealant) and that insulating glass seals will withstand structural loading requirements.
- H. Compatibility and Adhesion Test Report: Submit statement from sealant manufacturer indicating glass and glazing materials have been tested for compatibility and adhesion with glazing sealants and interpreting test results relative to material performance, including recommendations for primers and substrate preparation needed to obtain adhesion.
  1. Compatibility test report from manufacturer of insulated glass unit edge sealant indicating glass edge sealants were tested for compatibility with other glazing materials including sealants, glazing tape, gaskets, setting blocks, and edge blocks.

#### **1.06 QUALITY ASSURANCE**

- A. Single Source Responsibility for Materials: Provide materials produced by a single manufacturer for each kind and condition of material indicated.
- B. Single Source Responsibility for Fabrication and Installation: Engage a fabricator/installer who shall assume undivided responsibility for all components of structural glazing work, including structural design and weatherproof integrity of the system in place.
- C. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, comply with CPSC 16 CFR Part 1201, Category II.
  1. Provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other agency acceptable to authorities having jurisdiction.

- D. Pre-Construction Compatibility and Adhesion Testing: Submit samples of all materials including glass, glazing material and accessories, and framing support members proposed for use in contact with or proximity of glazing including structural sealant, to sealant manufacturer for compatibility and adhesion testing in accordance with sealant manufacturer's standard testing methods and the following requirements:
  - 1. Submit not less than four pieces of each type and finish of glass framing member and of each type, glass, kind, condition and form (monolithic, laminated, insulating units) of glass for adhesion testing and one sample of glazing material substrates (gaskets, setting blocks, spacers, etc.) for compatibility testing.
  - 2. Testing is not required when glazing sealant manufacturer can submit required preparation data acceptable to Architect; based on previous testing of current sealant products for adhesion to and compatibility with submitted glazing materials.
- E. Structural Sealant: Provide manufacturer's structural glazing system that has been tested to demonstrate tensile or shear stress in structural silicone joints is not in excess of 20 psi with modulus of elasticity to allow no more than 25 percent movement of joint width, or less if required by sealant manufacturer.
  - 1. Provide supports and setting blocks at each light to support weight of glass; structural sealant shall not carry dead load of glass panels.
- F. Perform Work in accordance with GANA (GM), GANA (LGRM), GANA (SM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.
- G. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
  - 1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
    - a. Safety Glazing Certification Council (SGCC).
- H. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

#### **1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Protect glass and glazing materials during delivery, storage, and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damages to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and other causes.

#### **1.08 FIELD CONDITIONS**

- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes. Install glazing sealants only when temperatures are in middle third of manufacturer's recommended installation temperature range.
- B. Do not install glazing when ambient temperature is less than 40 degrees F.
- C. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

#### **1.09 WARRANTY**

- A. Laminated Glass: Provide written warranty signed by laminated glass manufacturer agreeing to remove and replace laminated glass units that deteriorate or have manufacturing defects. Warranty covers deterioration and defects due to normal conditions of use and not handling, installing, and cleaning practices contrary to glass manufacturer's published instructions.
  - 1. Warranty Period: Five (5) years after date of substantial completion.
- B. Coated Glass: Provide written warranty signed by coated glass manufacturer agreeing to remove and replace coated glass units that deteriorate or have manufacturing defects. Warranty covers deterioration and defects due to normal conditions of use and not handling, installing, and cleaning practices contrary to glass manufacturer's published instructions.

1. Warranty Period: Ten (10) years after date of substantial completion.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Glass Fabricators:
  1. Glass and Mirror Craft: [www.glassandmirrorcraft.com](http://www.glassandmirrorcraft.com)
  2. Midwest Glass Fabricators: [www.mwgf.com](http://www.mwgf.com)
  3. Tecnoglass: [www.tecnoglass.com/#sle](http://www.tecnoglass.com/#sle).
  4. Thompson I.G., LLC: [www.thompsonig.com/#sle](http://www.thompsonig.com/#sle).
  5. Trulite Glass & Aluminum Solutions, LLC: [www.trulite.com/#sle](http://www.trulite.com/#sle).
  6. Viracon, Inc: [www.viracon.com/#sle](http://www.viracon.com/#sle).
- B. Float Glass Manufacturers:
  1. Cardinal Glass Industries: [www.cardinalcorp.com/#sle](http://www.cardinalcorp.com/#sle).
  2. Guardian Glass, LLC: [www.guardianglass.com/#sle](http://www.guardianglass.com/#sle).
  3. Pilkington North America Inc: [www.pilkington.com/na/#sle](http://www.pilkington.com/na/#sle).
  4. Saint Gobain North America: [www.saint-gobain.com/#sle](http://www.saint-gobain.com/#sle).
  5. Vitro Architectural Glass (formerly PPG Glass): [www.vitroglazings.com/#sle](http://www.vitroglazings.com/#sle).

### **2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES**

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
  1. Design Pressure: Calculated in accordance with ASCE 7.
  2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
  3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges as follows:
    - a. Member Deflection: For spans less than 13 feet 6 inches, limit member deflection to flexure limit of glass in any direction, and maximum of 1/175 of span or 3/4 inch, whichever is less and with full recovery of glazing materials.
    - b. Member Deflection: For spans over 13 feet 6 inches and less than 40 feet, limit member deflection to flexure limit of glass in any direction, and maximum of 1/240 of span plus 1/4 inch, with full recovery of glazing materials.
  4. Glass thicknesses listed are minimum.

### **2.03 GLASS MATERIALS**

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
  1. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
  2. Fully Tempered Safety Glass: Complies with 16 CFR 1201 - Category II criteria for safety glazing used in hazardous locations.
  3. Thicknesses: As indicated; provide greater thickness as required for spans and loading.

### **2.04 FABRICATION**

- A. Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer.
- B. Temper or heat strengthen glass where indicated or required for compliance with safety glass regulations or recommended by manufacturer/fabricator for size or thermal stress.
- C. Clean cut or flat grind vertical edges of butt-glazed monolithic lights in manner to produce square edges with slight kerfs.

### **2.05 GLAZING UNITS**

- A. Monolithic Interior Vision Glazing:
  1. Applications: Interior glazing unless otherwise indicated.
  2. Glass Type: Fully tempered float glass.



- a. Temper or heat strengthen glass where indicated or required for compliance with safety glass regulations or recommended by manufacturer/fabricator for size or thermal stress.
3. Tint: Clear.
4. Thickness: As indicated on Drawings

## **2.06 GLAZING SEALANTS AND TAPES**

- A. General: Provide products of type indicated and complying with the following requirements:
  1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates under conditions of installation and service, as demonstrated by testing and field experience.
  2. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and condition at time of installation.
  3. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C920 requirements, including those for Type, Grade, Class, and Uses.
  4. Colors: As selected by Architect from manufacturer's standard color range.
- B. High Modulus One-Part Silicone Sealant: Silicone sealant specifically designed and tested for use as structural sealant.
- C. Low Modulus One-Part Silicone Sealant: Silicone sealant compatible with structural silicone for use as secondary seal (weather-seal) and for butt glazing. Weather-seal shall accommodate a 50 percent increase or decrease of joint width as measured at time of application per ASTM C719. Provide manufacturer's recommended backer rod.
  1. Secondary structural silicone seal stress shall be designed considering that each light in an insulating glass unit, when both lights are of equal thickness, carries 50 percent of total applied wind load.
- D. Preformed Glazing Tape: Butyl-based formulation with solids content of 100 percent; in extruded tape form; non-staining and non-migrating in contact with nonporous surfaces; packaged in rolls with release paper on one side; with or without continuous spacer rod as recommended by manufacturers of tape and glass for application indicated, per ASTM C1281 and AAMA 800.
- E. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; \_\_\_\_\_ color.

## **2.07 ACCESSORIES**

- A. Setting Blocks: Neoprene, EPDM or silicone as required for compatibility with glazing sealants, with 80 to 90 Shore A durometer hardness; ASTM C864. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, EPDM or silicone as required for compatibility with glazing sealants, 50 to 60 Shore A durometer hardness; ASTM C864. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant and tape, of size and hardness required to limit lateral movement (side-walking) of glass.
- D. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with or without integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
  1. Width: As required for application.
  2. Thickness: As required for application.
  3. Spacer Rod Diameter: As required for application.

- E. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
- F. Glazing Clips: Manufacturer's standard type.
- G. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.

### **PART 3 EXECUTION**

#### **3.01 VERIFICATION OF CONDITIONS**

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

#### **3.02 PREPARATION**

- A. Clean contact surfaces with appropriate solvent and wipe dry immediately before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

#### **3.03 INSTALLATION, GENERAL**

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

#### **3.04 INSTALLATION METHODS**

- A. Provide any of the following installation methods as appropriate for installation location, sequencing, and conditions, at contractors option.

#### **3.05 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)**

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

### **3.06 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)**

- A. Application - Interior Glazed: Set glazing infills from the interior of the building.
- B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- E. Place glazing tape on free perimeter of glazing in same manner described above.
- F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- G. Carefully trim protruding tape with knife.

### **3.07 INSTALLATION - WET GLAZING METHOD (COMPOUND AND COMPOUND)**

- A. Application - Interior Glazed: Set glazing infills from the interior of the building.
- B. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.
- C. Locate and secure glazing pane using glazers' clips.
- D. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

### **3.08 INSTALLATION - WET/DRY GLAZING METHOD (TAPE AND SEALANT)**

- A. Application - Interior Glazed: Set glazing infills from the interior of the building.
- B. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sight line.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- D. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
- E. Install removable stops, spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.
- F. Fill gaps between pane and applied stop with \_\_\_\_\_ type sealant to depth equal to bite on glazing, to uniform and level line.
- G. Carefully trim protruding tape with knife.

### **3.09 CLEANING**

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

### **3.10 PROTECTION**

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste. Do not apply markers to surfaces of glass. Remove non-permanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.
- C. Remove and replace glass which is broken, chipped, cracked, abraded, or damaged in other ways during construction period, including natural causes, accidents, and vandalism.

- D. Exercise extreme care in handling, installation and protection of spandrel glass and glass products with shatter resistant film. Repair or replace any damaged coatings or surfaces as acceptable to and determined solely by Architect.

**END OF SECTION**

## **SECTION 08 8300 - MIRRORS**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Glass mirrors.

#### **1.03 REFERENCE STANDARDS**

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials Current Edition.
- B. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass 2019.
- C. ASTM C1036 - Standard Specification for Flat Glass 2021.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
- E. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror 2018.
- F. GANA (GM) - GANA Glazing Manual 2022.
- G. GANA (SM) - GANA Sealant Manual 2008.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds: Submit chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

#### **1.05 QUALITY ASSURANCE**

- A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.
- B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.

#### **1.06 FIELD CONDITIONS**

- A. Do not install mirrors when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

#### **1.07 WARRANTY**

- A. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Mirrors:
  - 1. Binswanger Mirror/ACI Distribution.
  - 2. Independent Mirror Industries, Inc.
  - 3. Lenoir Mirror Co.
  - 4. Trulite Glass and Aluminum Solutions: [www.trulite.com/#sle](http://www.trulite.com/#sle).
  - 5. Walker Glass Company Ltd: [www.walkerglass.com/#sle](http://www.walkerglass.com/#sle).
  - 6. Virginia Mirror Co.
  - 7. Guardian Industries

8. Vitro Architectural Glass

**2.02 MATERIALS**

- A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.
- B. Mirrored Laminated Glass: ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality Q2 (mirror); ASTM C1172, Kind LM, meeting CSPC 16 CFR 1201, Cat II.; silvering, protective coating, and quality requirements in compliance with ASTM C1503.
  - 1. Nominal thickness: Minimum 6 mm
- C. Mirror Edge Treatment: Provide flat polished edge treatment with edges sealed after treatment to prevent chemical or atmospheric penetration of glass coating.
  - 1. Perform edge treatment and sealing in factory immediately after cutting to final sizes.

**2.03 ACCESSORIES**

- A. Mirror Attachment Accessories: Manufacturer's recommended attachment hardware.
- B. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify openings for mirrored glazing are correctly sized and within tolerance.
- B. Verify surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive mirrors.

**3.02 PREPARATION**

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous mirror frames or recesses with substrate compatible primer or sealer. Prime surfaces scheduled to receive sealant.
- C. Perform installation per ASTM C1193 for solvent release sealants. Install sealant in accordance with manufacturer's instructions.

**3.03 INSTALLATION**

- A. Install mirrors in accordance with manufacturer's recommendations.
- B. Set mirrors plumb and level, and free of optical distortion.
- C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.
- D. Frameless Mirrors: Set mirrors in proper place with adhesive, applied in accordance with adhesive manufacturer's instructions. Provide supplementary clips for positive mechanical attachment.

**3.04 CLEANING**

- A. Remove wet glazing materials from finish surfaces.
- B. Remove labels after work is complete.
- C. Clean mirrors and adjacent surfaces.

**3.05 PROTECTION**

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

**END OF SECTION**

## **SECTION 09 2116 - GYPSUM BOARD ASSEMBLIES**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Metal channel ceiling framing.
- D. Cementitious backing board.
- E. Gypsum wallboard.
- F. Joint treatment and accessories.
- G. Acoustical bulkheads above operable partitions.

#### **1.03 REFERENCE STANDARDS**

- A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing 2020.
- B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing 2015, with Errata (2020).
- C. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units 2018.
- D. ANSI A118.1 - American National Standard Specifications for Dry-Set Cement Mortar 2019.
- E. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar 2019.
- F. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units 2019.
- G. ANSI A118.9>ANSI A108/A118/A136.1 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units 1999 (Reaffirmed 2010).
- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- I. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members 2015.
- J. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2017 (Reapproved 2022).
- K. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2018.
- L. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.
- M. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.
- N. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2020.
- O. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications 2022.
- P. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness 2022.
- Q. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2022.

- R. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base 2019.
- S. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units 2022.
- T. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.
- U. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2021.
- V. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2022.
- W. GA-214 - Levels of Finish for Gypsum Panel Products 2021.
- X. GA-216 - Application and Finishing of Gypsum Panel Products 2021.
- Y. GA-600 - Fire Resistance and Sound Control Design Manual 2021.
- Z. UL (DIR) - Online Certifications Directory Current Edition.

#### **1.04 SUBMITTALS**

- A. Shop Drawings: Provide Shop Drawings indicating the following:
  - 1. Movement joint layout for all gypsum board surfaces.
- B. Product Data: Provide data on metal framing, gypsum board, accessories, joint finishing system, and cement board. Provide manufacturer's specifications and installation instructions for each gypsum wallboard component, including other data as required to show compliance construction documents.
- C. Samples: Submit two samples of predecorated gypsum board, 12 by 12 inches in size, indicating finish color and texture.

#### **1.05 QUALITY ASSURANCE**

- A. Fire-Test-Response Characteristics: Where fire-rated gypsum board assemblies are indicated, provide assemblies to comply with the following:
  - 1. Provide gypsum board assemblies with materials and construction identical to those assemblies tested for fire resistance per ASTM E119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
  - 2. Fire Resistance Ratings: As indicated by reference to GA File Numbers in GA-600 "Fire Resistance Design Manual", or design designations in UL "Fire Resistance Directory" or in listing of other testing and inspecting agency acceptable to authorities having jurisdiction.
  - 3. Fire Resistance submittal: Fire Resistive design numbers indicated in the Construction Documents are Basis of Design. If products listed within this Section are provided but are not part of Fire Resistive Assembly used as Basis of Design, contractor is responsible to submit to Architect as part of Shop Drawing submission the GA File Number(s) in GA-600 "Fire Resistance Design Manual", or design designations in UL "Fire Resistance Directory" or in listing of other testing and inspecting agency acceptable to authorities having jurisdiction, indicating compliance with fire resistive requirements for project.
- B. Source Limitations: Obtain each type of steel framing, and finishing materials through one source, from a single manufacturer. Each type of gypsum board and the finishing compound(s) used on that board must be obtained from a single source and a single manufacturer.

#### **1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.
- C. Handle board materials to prevent damage to edges, ends and surfaces. Do not bend or otherwise damage metal corner beads and trim.



## 1.07 ENVIRONMENTAL REQUIREMENTS

- A. Environmental Conditions: Establish and maintain environmental conditions for application and finishing gypsum board per ASTM C840 and with gypsum board manufacturer's recommendations.
- B. Minimum Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40 degF (4 degC). For adhesive attachment and finishing of gypsum board maintain not less than 50 degF (10 degC) for 48 hours prior to application and continuously thereafter until drying is complete.
- C. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

## PART 2 PRODUCTS

### 2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Fire-Resistance-Rated Assemblies: Provide completed assemblies with UL design numbers as indicated on Drawings
  - 1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (DIR).

### 2.02 METAL FRAMING MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S240.
- B. Manufacturers - Metal Framing, Connectors, and Accessories:
  - 1. ClarkDietrich: [www.clarkdietrich.com](http://www.clarkdietrich.com).
  - 2. Jaimes Industries: [www.jaimesind.com/#sle](http://www.jaimesind.com/#sle).
  - 3. MarinoWare: [www.marinoware.com](http://www.marinoware.com).
  - 4. MBA Metal Framing
  - 5. MRI Steel Framing, LLC
  - 6. State Building Products
  - 7. Telling Industries: [www.tellingindustries.com](http://www.tellingindustries.com)
- C. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel ASTM A653/A653M, G40 hot dip, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/360 at 5 psf.
  - 1. Studs: C-shaped with knurled or embossed faces.
    - a. Minimum thickness: 22 gage or 22 EQ, unless otherwise noted.
    - b. Minimum thickness for the following locations, 0.0329 inch (20 gage) or 20 EQ:
      - 1) For head runner, sill runner, jamb and cripple studs at door and other openings.
      - 2) In locations to receive abuse resistant or impact resistant board material.
    - c. Minimum thickness for walls receiving tile or stone facing: 0.0329 inches (20 gage). 20 EQ is NOT acceptable for this application.
    - d. Minimum thickness for walls receiving stone facing: 0.0538 (16 gage). EQ studs are not acceptable for this application.
    - e. Extend studs full height (floor to deck), unless otherwise indicated.
  - 2. Runners: U shaped, sized to match studs.
  - 3. Ceiling Channels: C-shaped.
    - a. Minimum Thickness: 22 gage or 22 EQ
  - 4. Bridging/Bracing Bar and Clips: Engineered, pre-notched, 20 gage galvanized sheet steel spacer bar for interior metal stud walls.
    - a. Manufacturers - Bridging/Bracing Bar:
      - 1) ClarkDietrich; Spazzer Bar
      - 2) Simpson Strong-tie; DBR Spacer Bar
      - 3) Steel Network, Inc.; Bridge Bar
  - 5. Header System: Preformed, pre-engineered header/sill, minimum 20 gage, galvanized sheet steel for use at openings in metal stud wall systems.

- a. Manufacturers - HeaderSystem:
  - 1) Cemco; Pro X Header Rough Opening System
  - 2) ClarkDietrich; Red Header Pro Rough Opening System
- D. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
- E. Wall/Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of wall/partition.
  - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
  - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.
  - 3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of wall/partition joint systems of fire rating and movement required.
  - 4. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-resistance rating of the wall assembly.
    - a. Products:
      - 1) ClarkDietrich; MaxTrak Slotted Deflection Track: [www.clarkdietrich.com/#sle](http://www.clarkdietrich.com/#sle).
      - 2) MarinoWare; Slotted Track
      - 3) MBA Building Supplies; Slotted Slip Track: [www.mbastuds.com/#sle](http://www.mbastuds.com/#sle).
      - 4) Telling Industries; True-Action Slotted Track
  - 5. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet.

## 2.03 BOARD MATERIALS

- A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
  - 1. Thickness: Provide gypsum board in thickness indicated, or if not otherwise indicated, in 5/8 inch thickness.
  - 2. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
    - a. Types:
      - 1) Regular, unless otherwise indicated.
      - 2) Type X and Type C for fire-resistant rated assemblies and where indicated.
      - 3) Mold Resistant where indicated.
    - b. Edges: Tapered.
  - 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
    - a. Mold-resistant board is required at all exterior walls and gypsumboard walls/ceilings located in toilet and shower rooms.
  - 4. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
  - 5. Paper-Faced Products:
    - a. CertainTeed Corporation; Regular Gypsum Board / Type X & C
    - b. Georgia-Pacific Gypsum; Tough Rock Gypsum Board / Tough Rock Type X & C
    - c. National Gypsum Company; Gold Bond Brand Regular / Fireshield Type X & C
    - d. USG Corporation; Sheetrock Brand Gypsum Panels / Sheetrock Brand Firecode X & C.
  - 6. Mold-Resistant, Paper-Faced Products:
    - a. Certainteed Corporation; ProRoc MMR gypsum board with M2Tech and M2Tech Type X
    - b. Georgia-Pacific Gypsum; ToughRock Mold-Guard and Fireguard X Mold-Guard.
    - c. National Gypsum Company; Gold Bond XP Gypsum Board and XP Fireshield Gypsum Board.
    - d. USG Corporation; Sheetrock Brand Mold Tough / Mold Tough Firecode Gypsum Panels.
- B. Backing Board:

1. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
  - a. Products:
    - 1) Custom Building Products; Wonderboard.
    - 2) PermaBASE Building Products, LLC provided by National Gypsum Company; PermaBase Cement Board: [www.goldbondbuilding.com/#sle](http://www.goldbondbuilding.com/#sle).
    - 3) USG Corporation Durock: [www.usg.com](http://www.usg.com).
    - 4) FinPan, Inc.; ProTECConcrete Backer Board

## **2.04 GYPSUM BOARD ACCESSORIES**

- A. Wall/Partition Closures: Extruded aluminum adjustable spring loaded wall/partition closures.
  1. Location: All junctures of walls/partitions with other construction as indicated.
  2. Finish: Match curtainwall system.
  3. Products:
    - a. Gordon Inc.; Mullion Mate
- B. Wall/Partition End Caps: Extruded aluminum end cap with tapered fin to accent joint materials.
  1. Location: Provide at locations of all wall/partition closures and other locations indicated.
  2. Size: As required for wall thickness.
  3. Finish: Match curtainwall system
  4. Products:
    - a. Gordon Inc.; 911-EC
    - b. Fry Reglet; DMEC End Closure
- C. Sealant exposed to view: Provide paintable sealant at all locations exposed to view. Refer to Section 07 9200 - Joint Sealants.
- D. Interior Finishing Accessories: ASTM C1047, galvanized steel, rolled zinc, or rigid plastic, unless otherwise indicated. Provide with either knurled or perforated expanded flanges for nailing or stapling, and beaded for concealment of flanges, in joint compound. Provide tear away bead in profiles required to provide finished edges where gypsumboard abuts other materials.
  1. Shapes: As indicated below by reference to Figure 1 designations per ASTM C1047.
    - a. Corner bead on outside corners, unless otherwise indicated.
    - b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC beads for edge trim, unless otherwise indicated.
    - c. L-bead with face flange only; face flange formed to receive joint compound.
    - d. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.
    - e. One piece control joint formed with V-shaped slot and removable strip covering slot opening.
- E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
  1. Tape:
    - a. Paper faced Gypsum Board: Paper reinforcing tape
    - b. Mold Resistant Paper faced Gypsum Board: Glass mesh tape
  2. Joint Compound: Drying type, vinyl-based, ready-mixed.
    - a. Manufacturer: Same as wall board being provided.
  3. Joint Compound: Setting type, field-mixed.
    - a. Manufacturer: Same as wall board being provided.
  4. Cementitious Backer board Joint Compound: Latex-portland cement mortar per ANSI A118.1 and ANSI A118.4, refer to tiling specification Section 09 3000.
- F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

- G. Screws for Attachment to Steel Members From 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws for application of gypsum board to loadbearing steel studs; cadmium plated for exterior locations.
- H. Screws at Cement board: Provide corrosion resistant wafer head fasteners suitable for thickness of backing board and of type for substrate being fastened to.
- I. Laminating Adhesive: Manufacturers recommended adhesive or joint compound recommended for laminating gypsum boards.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine substrates to which board attaches or abuts, installed hollow metal frames, cast in anchors and structural framing with installer(s) present for compliance with requirements for installation tolerances and other conditions affecting performance of gypsum board assemblies specified in this Section.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### **3.02 FRAMING INSTALLATION**

- A. Metal Framing: Install in accordance with AISI S220 and manufacturer's instructions.
- B. Install supplementary framing, blocking and bracing at terminations in work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, door bumpers, furnishings and similar construction to comply with details indicated and with recommendations of gypsum board manufacturer, or if none available, with "Gypsum Construction Handbook", published by United States Gypsum Co.
- C. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement, at locations indicated below to comply with details shown on drawings.
  - 1. Where suspended ceiling assemblies abut building structure horizontally at ceiling perimeters or penetrations of ceiling.
  - 2. Where wall/partition framing abut overhead structure.
    - a. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.
- D. Do not bridge building expansion and control joints with steel framing or furring members, independently frame both sides of joints with framing or furring members or as indicated.
- E. Suspended Ceilings and Soffits: Space framing and furring members as indicated but not less than required by referenced steel framing standard.
  - 1. Level ceiling and soffit system to a tolerance of 1/1200 as measured both lengthwise in each member and transversely between parallel members.
  - 2. Laterally brace entire suspension system.
  - 3. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum not supporting structural or ceiling suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, counter splaying or other equally effective means.
  - 4. Where widths of ducts and other construction within ceiling plenum produce hanger spacings that interfere with the location of hangers at spacing required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
    - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
  - 5. Secure wire hangers to structure, by looping or wire tying, directly to supporting structure, including intermediate framing members. Attach to inserts, eye screws, or other devices appropriate for structure to which hangers are attached as well as for type of hanger involved, in manner that will not cause deterioration or failure, due to age, corrosion or elevated temperatures.
  - 6. Do not attach hangers to metal roof deck or metal deck tabs.
  - 7. Do not connect or suspend steel framing from ducts, pipes or conduits.

8. Keep hangers and bracing 2 inches clear of ducts, pipes and conduits.
  9. Sway-brace suspended steel framing with hangers used for support.
  10. Installation Tolerances: Install steel framing components for suspended ceilings so cross furring members are level to within 1/8 inch in 12 ft. as measured both lengthwise in each member and transversely between parallel members.
  11. Wire-tie or clip furring members to main runners and to other structural supports as indicated.
- F. Studs: Space studs as indicated.
1. Extend wall/partition framing full height to structural supports or substrates above suspended ceilings, except where walls/partitions are indicated to terminate at or just above suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating walls/partitions above ceiling to provide support for gypsum board.
    - a. Cut studs 1/2 inch short of full height to provide perimeter relief.
    - b. For STC-rated or fire-resistance rated walls/partitions that extend full height, install framing around structural members, as required to support gypsum board closures needed to make walls/partitions continuous from floor to underside of structure above.
    - c. Install bridging/spacing bar.
  2. Brace wall/partition framing, not extending full height to structure above, with studs same size and thickness as wall/partition framing. Provide bracing at:
    - a. 6'-0" o.c. intervals along length of walls/partitions.
    - b. Not less than 6'-0" from wall/partition ends and corners.
    - c. Door and window openings.
    - d. 6'-0" o.c. intervals along walls above all glass entrances and walls/partitions with at least one brace located at jamb side of all glass doors.
  3. Walls/Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- G. Frame door openings to comply with details indicated, with GA-216 and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
1. Install two jambs at studs, unless otherwise indicated.
  2. Install cripple studs at head adjacent to each jamb stud, with a minimum of 1/2 inch clearance from jamb to allow for the installation of a control joint in the finished assembly.
  3. Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
- H. Frame openings other than door openings to comply with details indicated, or if none indicated, in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.
- I. Blocking: Install blocking for support of:
1. Framed openings.
  2. Wall-mounted cabinets.
  3. Plumbing fixtures.
  4. Toilet partitions.
  5. Toilet accessories.
  6. Wall-mounted door hardware.
  7. Other locations as indicated on Drawings.

### 3.03 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within ceilings and walls/partitions, and tight to items passing through ceilings and walls/partitions.
  - 1. Install acoustic insulation where indicated, prior to gypsum board, unless readily installed after board has been installed on one side.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions and as follows.
  - 1. Place two beads continuously on substrate before installation of perimeter framing members.
  - 2. Set concealed (back) edge of gypsum board in a continuous bead of sealant laid at base/head of runner at perimeter of each wall/partition.
  - 3. Seal around all penetrations, including but not limited to structure, conduit, pipe, ducts, and rough-in boxes, using a combination of putty pads and sealant joints except where firestopping is provided. Where located in a fire rated assembly use fire putty and fire stopping systems. Refer to Section 07 8400 - Firestopping.

### 3.04 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions.
- B. Install gypsum board in manner to minimize end-butt joints or avoids them entirely where possible. At high walls, install boards horizontally with end joints staggered over studs.
  - 1. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches in alternate courses of board.
- C. Install ceiling boards across framing in manner to minimize end-butt joints, and avoids end joints in central area of each ceiling. Stagger end joints at least 24 inches.
- D. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.
- E. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints.
  - 1. Position boards so like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends.
  - 2. Do not place tapered edges against cut edges or ends.
  - 3. Stagger vertical joints over different studs on opposite sides of walls/partitions.
- F. Attach gypsum board to steel studs so leading edge or end of each board is attached to open (unsupported) edge of stud flange first.
- G. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.
- H. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors and doors over 32 inches wide except where full grout shown. Apply spot grout at each jamb anchor clip just before inserting board into frame.
- I. Form control joints and expansion joints at locations indicated or as recommended, with space between edges of boards, prepared to receive trim accessories.
  - 1. Provide fire-rated construction for control joints in rated construction to maintain fire rating.
- J. Cover both faces of steel stud wall/partition framing with gypsum board in concealed spaces (above ceiling, etc.), except in chase walls which are braced internally.
  - 1. Except where 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. area, and may be limited to not less than 75 percent of full coverage.
  - 2. Fit gypsum board around ducts, pipes and conduits.
- K. Isolate perimeters of ceilings and non-load-bearing gypsum board walls/partitions at structural abutments. Provide 1/4 to 1/2 inch space and trim edge with "U" bead edge trim. Seal joints with acoustical sealant unless fire resistant sealant shown.

- L. Where STC-rated gypsum board assemblies are indicated, seal construction at perimeters, behind control and expansion joints, openings, and other penetrations with a continuous bead of acoustical sealant. Include a bead of sealant at both faces of walls/partitions.
  - 1. Comply with ASTM C919 and manufacturer's recommendations for location of edge trim and closing off sound flanking paths around or through gypsum board assemblies, including walls/partitions extending above ceilings.
  - 2. At operable partitions provide acoustical bulkhead with STC-rated assembly matching the STC of operable partition below.
- M. Space fasteners in gypsum board in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.
- N. Space fasteners in panels that are tile substrates maximum 8 inches o.c.

### **3.05 INSTALLATION OF CEMENTITIOUS BACKING BOARD**

- A. Install cementitious backer units per ANSI A108.11.
- B. Install cementitious backing boards in manner to minimize end-butt joints or avoid them entirely where possible.
- C. Do not install imperfect, damaged or damp boards. Butt boards together for light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.
- D. Locate both edge or end joints over supports.
  - 1. Position boards so like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends.
  - 2. Do not place tapered edges against cut edges or ends.
  - 3. Stagger vertical joints over different studs in successive courses.
- E. Attach cementitious backing board to steel studs so leading edge or end of each board is attached to open (unsupported) edge of stud flange.
- F. Place fasteners in field of panels first, working out toward edges. Space fasteners maximum 8 inches o.c.

### **3.06 METHODS OF GYPSUM BOARD APPLICATION**

- A. Single-Layer Application: Install gypsum board as follows:
  - 1. On ceilings apply gypsum board prior to wall/partition board application to greatest extent possible.
  - 2. On walls/partitions apply gypsum board vertically (parallel to framing), unless otherwise indicated or required by fire resistance rated assembly, and provide sheet lengths which will minimize end joints.
    - a. On walls/partitions 8'-1" or less in height, apply gypsum board horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.
    - b. At stairwells and other high walls, install gypsum board horizontal, unless otherwise indicated or required for fire resistance rating.
    - c. On Z-furring, apply gypsum panels vertically (parallel to framing). Locate edge joints over furring member.
- B. Double-Layer Application: Install gypsum backing board for base layer and exposed gypsum board for face layer.
  - 1. On ceilings apply base layer prior to application of face layer on walls/partitions; apply face layers in same sequence. Offset joints between layers minimum one stud space. Apply base layers at right angles to supports, unless otherwise indicated.
  - 2. On walls/partitions apply base layer and face layers vertically (parallel to framing) with joints of base layer over supports and face layer joints offset minimum one stud space with base layer joints.
- C. Single-Layer Fastening Methods: Apply gypsum boards to metal supports with screws and to wood supports with nails.

- D. Double-Layer Fastening Methods: Apply base layer of gypsum board and face layer to base layer with screws and face layer with adhesive and supplementary fasteners, except where otherwise required for fire-resistance rated assemblies.
- E. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

### **3.07 INSTALLATION OF TRIM AND ACCESSORIES**

- A. General: Where feasible, use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.
- B. Install corner beads at external corners.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed. Provide type with face flange to receive joint compound except where "U" bead (semi-finishing type) is indicated.
  - 1. Install "LC" bead where drywall construction is tightly butted to other construction and back flange can be attached to framing or supporting substrate.
  - 2. Install "LK" bead where substrate is kerfed to receive long flange of trim.
  - 3. Install "L" bead where edge trim can only be installed after gypsum board is installed.
  - 4. Install U-type trim where edge is exposed, gasketed or sealant-filled (including expansion joints).
- D. Install control joints at locations indicated, or if not indicated, at spacings and locations required by ASTM C840 and manufacturer's recommendations; and approved by Architect for visual effect.
- E. Install reveals at locations indicated.

### **3.08 JOINT TREATMENT**

- A. General: Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration.
- B. Prefill open joints using setting-type joint compound.
- C. Where patching and repair of holes in gypsum board is required, use setting-type compound to fill the void and finish with ready-mix drying type compound
- D. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.
- E. Finish interior gypsum wallboard by applying joint compound in three coats (not including prefill of openings in base), sand between coats, and after last coat. Provide setting or ready mix compounds as required to provide level of finish indicated without any shrinkage of joints.
- F. Mold Resistant Gypsum Board: Finish using setting type joint compounds to prefill joints and embed tape, for first, fill (second), and finish (third) coats, with last coat being a sandable product. Smooth each coat before joint compound hardens to minimize sanding.
- G. Partial Finishing: Omit third coat and sanding on concealed drywall construction indicated for drywall finishing or which requires finishing to achieve fire-resistance rating, sound rating or to act as air or smoke barrier.
- H. Finish gypsum board in accordance with levels defined in Gypsum Association GA-214 "Recommended Levels of Gypsum Board Finish", as follows:
  - 1. Level 1: Ceiling plenum areas and concealed areas, except provide higher level of finish as required to comply with fire resistance ratings and acoustical ratings.
    - a. Embed tape in joint compound. Tool marks and ridges are acceptable.
  - 2. Level 2: Gypsum board substrate at tile, except remove tool marks and ridges.
    - a. Embed tape in joint compound and apply first coat of compound. Cover fastener heads with joint compound.
  - 3. Level 3: Gypsum board substrate at areas of textured finishes and heavy duty wall coverings.



- a. Embed tape in joint compound and apply first and second coats of compound. Cover fastener heads with 2 coats of joint compound.
- 4. Level 4: Gypsum board surfaces, except where another finish level is indicated.
  - a. Embed tape in joint compound and apply first, second, and finish coats of compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat to produce a surface free of visual defects, ready for decoration.
- I. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
  - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
  - 2. Taping, filling, and sanding are not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.
  - 3. Taping, filling, and sanding are not required at base layer of double-layer applications.
- J. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

### **3.09 WALL/PARTITION IDENTIFICATION**

- A. Place identification on all walls/partitions indicated on Drawings as requiring opening protectives, including walls having a required fire or smoke rating.
- B. Identification shall be located in accessible concealed floor, floor-ceiling or attic spaces and as follows:
  - 1. Locate: Within 15 feet of the end of each wall and at intervals not exceeding 30 feet measured horizontally along wall/partition.
  - 2. Lettering: Not less than 3 inches in height with a minimum stroke width of 3/8 inches. Use a color that contrasts with the substrate and incorporate the same rating/designation as indicated on drawings and include the suggested wording " FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS".

### **3.10 CLEANING AND PROTECTION**

- A. Promptly remove any residual joint compound from adjacent surfaces.
- B. Provide final protection and maintain conditions, in manner suitable to Installer, to ensure gypsum board assemblies are without damage or deterioration at time of Substantial Completion.

### **3.11 TOLERANCES**

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

### **END OF SECTION**

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## **SECTION 09 3000 - TILING**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Wall and Floor tile.

#### **1.03 REFERENCES**

- A. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework 2017.
- B. ANSI A108.17 - Installation of Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone 2005 (2016).
- C. ANSI A108/A118/A136.1 - Specifications for the Installation of Ceramic Tile 2020.
- D. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone 2014 (Reaffirmed 2019).
- E. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation 2014 (Reaffirmed 2019).
- F. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar 2019.
- G. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation 2019.
- H. ANSI A137.1 - American National Standard Specifications for Ceramic Tile 2022.
- I. ASTM C627 - Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester 2010.
- J. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
- K. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation 2022.

#### **1.04 DEFINITIONS**

- A. Large Format Tile: Tile where one or more sides is greater than or equal to 12 inches.
- B. Tile Panels/Slabs: A tile size greater than or equal to 11 square feet (1 square meter).

#### **1.05 ADMINISTRATIVE REQUIREMENTS**

- A. Schedule a pre-installation conference at the Project site, minimum one week prior to start of tile floor work, with the following parties in attendance.
  - 1. Architect.
  - 2. General Contractor.
  - 3. Tile Manufacturer.
  - 4. Tile Installer.
  - 5. Other interested parties.
- B. Review methods and procedures related to tile floor system including, but not limited to, the following:
  - 1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
  - 2. Review tile floor patterns and mock-ups.
  - 3. Review structural loading limitations.
  - 4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

- C. General Contractor shall record discussion, including agreement or disagreement on significant matters. Furnish copies of report to all parties present within 5 days after meeting date.
  - 1. If substantial disagreements exist at conclusion of meeting, determine how disagreements will be resolved, and set date and time to reconvene meeting.

#### **1.06 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's technical information and installation instructions for materials required except bulk materials.
- C. Samples: Submit each item listed below, prepared on samples of size and construction indicated. Where products involve color and texture variations, show full range of variations expected in sets.
  - 1. Full-size units of each type of trim for each color required.
- D. Shop Drawings: As follows:
  - 1. Widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finish tile surfaces.
  - 2. Tile patterns indicating colors selected.
- E. Test Reports: Indicating vapor emission rate and diagram showing vapor emission test locations and results of relative humidity test.
- F. Certification: Submit Master Grade Certificates for each shipment, type and composition of tile, signed by tile manufacturer and installer.
- G. Qualification Data: Submit written information to establish installer qualifications, demonstrating capabilities and experience. Include list of completed projects with project names, addresses, name of Architects and Owners, and other information as required.
- H. Maintenance Materials: Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
  - 1. Tile:
    - a. One box of each color and pattern.
    - b. Five pieces of each special shape.
  - 2. Trim Units: Two pieces of each special shape.

#### **1.07 QUALITY ASSURANCE**

- A. Single-Source Responsibility for Tile: Obtain each color, grade, finish, type, composition and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
  - 1. Provide each color, grade, finish, type, composition and variety of tile from the same manufacturing run/batch.
- B. Single-Source Responsibility for Setting and Grouting Materials: Obtain ingredients of a uniform quality from one manufacturer for substrate preparation, including but not limited to waterproofing membrane, crack suppression membrane and leveling materials; setting materials and grouting materials.
- C. Installer Qualifications: A firm with minimum five years successful experience in tile installations similar to this Project, and who is acceptable to manufacturers of tile and setting materials.

#### **1.08 DELIVERY, STORAGE, AND PROTECTION**

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.
  - 1. Comply with requirements of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter and other causes.

## **1.09 COORDINATION**

- A. Coordinate the location of movement joints with the locations of expansion, control, construction, cold, saw-cut, isolation, contraction and seismic joints. Obtain the substrate movement joint locations from the trade responsible for the installation of the substrate. Submit to Architect with shop Drawings for movement joint layout confirmation.

## **1.10 FIELD CONDITIONS**

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- B. Maintain lighting in spaces receiving tiling at levels similar to those designed for final installation..
- C. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.
- D. Maintain temperature of 50 degF or more in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Manufacturer: Subject to compliance with requirements, provide products of only the following:
  - 1. Tile Manufacturer: Basis of Design indicated on Finish Key.
  - 2. Other acceptable Manufacturers: Subject to compliance with requirements provide Basis of Design product(s) or comparable product by one of the following:
    - a. Olympia Tile International Inc.; [www.olympiatile.com/#sle](http://www.olympiatile.com/#sle).
    - b. Atlas Concorde USA; [www.atlasconcordeusa.com/#sle](http://www.atlasconcordeusa.com/#sle)
    - c. Stonepeak Ceramics Inc.; [www.stonepeakceramics.com/#sle](http://www.stonepeakceramics.com/#sle)
  - 3. Setting and Grouting Materials
    - a. Custom Building Products
    - b. Laticrete International, Inc.
    - c. Mapei Corporation.
- B. Substitutions: See Section 01 25 00 - Substitution Procedures.

### **2.02 PRODUCTS, GENERAL**

- A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 for types, compositions and grades of tile indicated.
  - 1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
- B. ANSI Standard for Tile Installation Materials: Comply with ANSI Standard referenced with products and materials indicated for setting and grouting.
- C. Colors, Textures and Patterns: Where manufacturer's standard products are indicated for tile, grout and other products requiring selection of colors, surface textures, patterns and other appearance characteristics, provide specific products or materials complying with the following requirements:
  - 1. Match color, texture and pattern indicated on Room Finish Schedule by reference to manufacturer's standard designations for these characteristics.
  - 2. Provide tile trim that matches color and finish of adjoining flat tile, unless otherwise indicated.
- D. Factory Blending: For tile exhibiting color variations within the ranges selected during sample submittals, blend tile in factory and package accordingly so tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.
- E. Mounting: Where factory-mounted tile is acceptable, provide back-or-edge-mounted tile assemblies as standard with manufacturer unless another mounting method is indicated.

### 2.03 TILE PRODUCTS

- A. Tile: Provide flat tile complying with requirements indicated on the Room Finish Key.
- B. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:
  - 1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile, where applicable.
  - 2. Shapes: As indicated, selected from manufacturer's standard shapes.

### 2.04 SELF LEVELING UNDERLAYMENT

- A. Lightweight Portland cement based self leveling mortar used to level uneven substrate.
- B. Products: Subject to compliance with requirements provide one of the following:
  - 1. Custom Building Products; Level Lite Self-Leveling Underlayment or Level Quik RS
  - 2. Laticrete; Latilevel 84 / Latilevel 86 or Laticrete NXT Level System
  - 3. Mapei; UltraPlan M20 Plus

### 2.05 WATERPROOFING AND CRACK SUPPRESSION MEMBRANE

- A. Fluid applied/ fabric reinforced elastomeric waterproofing and crack suppression membrane: Manufacturer's standard single component self curing liquid membrane with fabric reinforcement meeting ANSI A118.10 and ANSI A118.12. Rated for Extra Heavy Service (ASTM C627 cycles 1 through 14) per TCNA (HB).
- B. Products: Subject to compliance with requirements provide one of the following:
  - 1. Custom Building Products; 9240 Waterproofing and Crack Suppression Membrane
  - 2. Laticrete International Inc.; 9235 Waterproof Membrane
  - 3. Mapei Corporation; Mapelastic 315

### 2.06 SETTING MATERIALS

- A. Bond Coat: Provide materials to comply with ANSI A118.15, minimum 400 psi shear strength when tested on porcelain mosaic tile, as follows:
  - 1. Polymer Modified Portland Cement Mortar:
    - a. Products: Subject to compliance with requirements provide one of the following:
      - 1) Custom Building Products; Megalite
      - 2) Laticrete International, Inc.; 254 Platinum
      - 3) Mapei Corporation; Ultraflex 3
      - 4) HB Fuller Construction Products; 3N1 Performance Mortar
    - b. Large Format tile application products: Subject to compliance with requirements provide one of the following:
      - 1) Custom Building Products; ProLite Tile and Stone Mortar
      - 2) Laticrete International, Inc.; MultimaxLite
      - 3) Mapei Corporation; Ultraflex 3
    - c. Where setting light colored tile or glass tile provide white mortar mix.

### 2.07 GROUTING MATERIALS

- A. Polymer Modified Portland Cement Grout: ANSI A118.7 for materials, composed as follows:
  - 1. Mixture of factory-prepared, polymer modified dry-grout mix complying with the following requirements:
    - a. For joints 1/16 inch and greater, use one of the following:
      - 1) Laticrete International, Inc.; Permacolor Select
      - 2) Custom Building Products; Prism
      - 3) Mapei Corporation; Ultracolor Plus FA.
- B. Grout Sealer: Waterbased grout sealer for use with polymer modified portland cement grout
  - 1. Products: Subject to compliance with requirements provide penetrating grout sealer compatible to polymer modified portland cement grout. Manufacturers may include but are not limited to the following:
    - a. Miracle Sealants

- b. AquaMix

## **2.08 ELASTOMERIC SEALANTS**

- A. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.
- B. One-Part, Mildew-Resistant Silicone Sealant: ASTM C920; Type S; Grade NS, Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.
- C. Products: Subject to compliance with requirements, provided one of the following:
  - 1. One-Part Mildew-Resistant Silicone Sealants:
    - a. Custom Building Products; Commercial 100% Silicone Caulk
    - b. Laticrete International, Inc.; Latasil Sealant
    - c. Mapei Corporation; Mapesil 100% Silicone

## **2.09 MISCELLANEOUS MATERIALS**

- A. Metal Edge Strips:
  - 1. Walls: Metal shapes with integral provision for anchorage to mortar bed or substrate unless otherwise indicated. Provide matching end/corner termination pieces as required.
    - a. Products: Subject to compliance with requirements, provide products by the following:
      - 1) Schluter Systems;

## **2.10 MIXING MORTARS AND GROUT**

- A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers instructions including those for accurate proportioning of materials, water or additive content.
- B. Obtain and use type of mixing equipment, selection of mixer speeds, mixing containers, mixing time and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

# **PART 3 EXECUTION**

## **3.01 EXAMINATION**

- A. Examine substrates and areas where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
  - 1. Verify substrates for setting tile are firm, dry, clean and free from oil or waxy films and curing compounds.
  - 2. Verify installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
  - 3. Verify joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.
- B. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
  - 1. Test in accordance with Section 09 0561 - Common Work Results for Flooring Preparation.
  - 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
  - 3. Follow moisture and alkalinity remediation procedures in Section 09 0561 - Common Work Results for Flooring Preparation.
- C. Do not proceed with installation until satisfactory conditions have been corrected.

## **3.02 PREPARATION**

- A. Provide substrates for tile that comply with flatness tolerances as follows:
  - 1. For thin bed tile installations with cementitious bonding material (including medium bed) maximum allowable variation:

- a. Tiles with all edges shorter than 15 inches: Maximum variation 1/4 inch in 10 feet from the required plane, with no more than 1/16 inch variation in 12 inches when measured from the high points in the surface.
  - b. Tiles with One or more edges 15 inches in length or greater: Maximum variation 1/8 inch in 10 feet from the required plane, with no more than 1/16 inch variation in 24 inches when measured from the high points in the surface.
  - c. For modular substrates (plywood, cement board or CMU): Adjacent edges cannot exceed 1/32 inch difference in height.
2. Where substrates are not within tolerance, remove protrusions, bumps, and ridges by sanding or grinding. Fill in uneven spots that can't be ground out using self leveling material.
- B. Clean substrates as required and recommended to achieve bond using cleaners, detergents or other recommended materials.
- C. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify tile has been blended in factory and packaged accordingly so tile units taken from one package show the same color range as those taken from other packages and match approved samples.
  1. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

### 3.03 TILE INSTALLATION, GENERAL

- A. ANSI Tile Installation Standard: Comply with ANSI A108/A118/A136.1 as applicable to types of setting and grouting materials and methods indicated.
- B. TCNA Installation Guidelines: TCNA (HB); comply with TCNA installation methods indicated, or if not otherwise indicated, as applicable to installation conditions shown.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns.
  1. Perform cutting and drilling of tile without marring visible surfaces.
  2. Carefully grind cut edges of tile abutting trim, finish or built-in items for straight aligned joints.
  3. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars, or covers overlap tile.
- E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints where adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
  1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.
- F. Movement Joints: All expansion, control, construction, cold, saw-cut, isolation, contraction and seismic joints in substrate should continue through the tilework, including such joints in vertical surfaces.
  1. Location and Frequency of Movement Joints: Comply with the following and the joint spacing recommendations set forth in TCNA (HB) EJ171.
    - a. Interior Slab on Grade Application, unless otherwise indicated: 20 feet to 25 feet in each direction.
    - b. Interior Applications exposed to moisture or direct sunlight: 8 feet to 12 feet in each direction.
    - c. Interior Applications on above ground concrete slab (supported slab): 8 feet to 12 feet in each direction.
    - d. Perimeter Joints: Provide movement joint where tilework abuts restraining surfaces including but not limited to the following:
      - 1) Perimeter walls



- 2) Dissimilar Floors
  - 3) Curbs
  - 4) Columns
  - 5) Pipes
  - 6) Ceilings
  - 7) Between stair treads and risers
  - 8) Between edges of stair risers, edges of stair treads and stringers.
  - 9) At changes in substrate materials
  - 10) Exception: Movement joints are not required at drain strainers.
2. Size of movement joint: Joint size shall match grout joint size but shall not be less than 1/8 inch wide. Additionally movement joints must not be less than the width of the saw cut control joint width.
  3. Verify width of saw cut control joints in field. Inform Architect if joint width exceeds the size of the grout joints specified.
- G. Clean all tile prior to applying sealer. Apply sealer to stone tile prior to grouting. Do not saturate open grout joints. Apply as recommended by sealer manufacturer. Remove any sealer residue using products recommended by sealer manufacturer. Allow sealer to cure for duration specified by sealer manufacturer before grouting tile.
- H. Grout tile to comply with ANSI A108.10 installation standard using grouting materials indicated.

### **3.04 WATERPROOFING AND CRACK SUPPRESSION MEMBRANE INSTALLATION**

- A. Comply with ANSI A108.17, ANSI A108.13, TCNA (HB) and manufacturers instructions.
- B. Pretreat with manufacturer's membrane reinforcement approved for use in this system, all cracks, cold joints, seams, coves, corners and floor to wall transitions using methods outlined in manufacturers written instructions.
- C. Pretreat all drains and other penetrations using methods outlined in manufacturers written instructions.
- D. Apply product at spreading rates required by manufacturer to provide Crack Suppression, Waterproofing or Crack Suppression and Waterproofing functions as indicated for each Tile Installation Method.
- E. Inspect completed waterproofing/crack suppression membrane installation for pinholes, voids, thin spots and other defects in application, prior to proceeding with remainder of tile installation. Correct defects using methods recommended by manufacturer to maintain system warranty before proceeding.

### **3.05 TILE INSTALLATION METHODS**

- A. Set tile per ANSI A108/A118/A136.1, TCNA (HB), and with combined recommendations of tile and setting materials manufacturers.
  1. Apply bond coat or thin set mortar with recommended type and size of notched trowel.
  2. Apply bond coat to a uniform depth to prevent non-uniform shrinkage of mortar and subsequent cracking of tiles.
  3. Butter entire back surface of each tile unit with recommended trowel.
  4. Twist and press each tile into place.
  5. Beat tile in as required for 100 percent mortar contact and flush and plumb installation.
- B. Floors: Install tile to comply with requirements indicated below for setting bed methods, TCNA (HB) installation methods related to type of subfloor construction and grout type.
  1. Thin-set Mortar with Waterproofing and Crack Suppression Membrane:
    - a. Concrete Subfloors, Interior: TCNA F122 and F125 (Full coverage).
    - b. Grout: Polymer Modified Portland Cement Grout.
    - c. Waterproofing/Anti-Fracture Membrane: Waterproofing and Crack Suppression Membrane
    - d. Bond Coat: Polymer Modified Portland Cement Mortar
    - e. Location: Install at all floor tile areas both SOG and at access flooring.

- 1) In addition to providing waterproofing membrane as part of tile installation, provide waterproofing membrane at toilet rooms below raised access flooring as indicated on Drawings.
2. Joint Widths:
  - a. 1/8 inch for porcelain tile, unless otherwise indicated.
  - b. 1/16 inch for ceramic mosaic tile, unless otherwise indicated. Where joining premounted tiles, match the joint between sheets to the size of the joints between tiles within the sheets.
3. Back Buttering: Obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 Series of tile installation standards.
  - a. Tile floors composed of tile 6 inches by 6 inches or larger.
  - b. Tile floors composed of rib backed tile.
- C. Walls: Install tile to comply with requirements indicated below for setting bed methods, TCNA installation methods related to subsurface wall conditions and grout type.
  1. Joint Width: 1/16 inch, unless otherwise indicated. Where joining premounted tiles, match the joint between sheets to the size of the joints between tiles within the sheets.
  2. Metal Edge Strips: Install metal edge strips in continuous lengths from floor to ceiling or other point of termination.
    - a. Install metal edge strips at exposed tile edges, including, but not limited to, the following locations:
      - 1) Exposed end conditions.
      - 2) Outside corners.
      - 3) Top of wainscots.

### **3.06 CLEANING AND PROTECTION**

- A. Cleaning: Upon completion of grout placement, clean all tile surfaces so they are free of foreign matter.
  1. Remove latex-Portland cement grout residue from tile as soon as possible.
  2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturers' printed instructions, but no sooner than 14 days after installation.
    - a. Protect metal surfaces, cast iron and vitreous plumbing fixtures from effect of acid cleaning.
    - b. Flush surface with clean water before and after cleaning.
- B. Sealer: Apply sealer to stone surfaces in accordance with manufacturer's instructions. Apply multiple coats as required to cause liquid water to bead on surface of stone and not penetrate.
- C. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded or otherwise defective tile work.
- D. Provide final protection and maintain conditions in manner acceptable to manufacturer and installer to ensure tile is without damage or deterioration at time of Substantial Completion.
  1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors.
    - a. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage and wear.
- E. Before final inspection, remove protective coverings and rinse tile surfaces with neutral cleaner.

### **END OF SECTION**

## **SECTION 09 5100 - ACOUSTICAL CEILINGS**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Suspended metal grid ceiling system.

#### **1.03 REFERENCE STANDARDS**

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings 2022.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Sequence work to ensure interior acoustical ceilings are not installed until building is enclosed, dry, sufficient heat is provided, dust generating activities have terminated, and above ceiling work is completed, tested, and approved and humidity will be continuously maintained at values near those indicated for final occupancy.

#### **1.05 SUBMITTALS**

- A. See Section 01 3323 - Shop Drawings, Product Data, and Samples, for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.
- C. Product Data: Provide data on each suspension system components.
- D. Samples: Submit two samples each, 12 inches long, of suspension system main runner, cross runner, and perimeter molding.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Common Product Requirements, for additional provisions.

#### **1.06 QUALITY ASSURANCE**

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

### **PART 2 PRODUCTS**

#### **2.01 SUSPENSION SYSTEM(S)**

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
- B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
  - 1. Materials:
    - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- C. Exposed Suspension System: Hot-dip galvanized steel grid and steel or aluminum cap.
  - 1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.

2. Profile: Tee; 15/16 inch face width.
3. Finish: Baked enamel.
4. Color: White
5. Products:
  - a. Armstrong World Industries, Inc.; Prelude XL Fire Guard 15/16 inch Exposed Tee
  - b. CertainTeed Corporation 15/16 inch Fire Secure Stab System:  
[www.certainteed.com/ceilings-and-walls/#sle](http://www.certainteed.com/ceilings-and-walls/#sle).
  - c. Rockfon; Chicago Metallic 260 Aluminum Cap 15/16 inch
  - d. USG Corporation; Donn Brand DX/DXL 15/16 inch Acoustical Suspension System:  
[www.usg.com/ceilings/#sle](http://www.usg.com/ceilings/#sle).

## **2.02 ACCESSORIES**

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: Provide wire sized so that stress at 3 times hanger design load (ASTM C635/C635M, Table 1, Direct-Hung), will be less than yield stress of wire, but provide not less than 12 gauge, 0.08 inch galvanized steel wire.
- C. Perimeter Moldings: Same metal and finish as grid.
  1. Size: As required for installation conditions and specified Seismic Design Category.
  2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
  3. Gaskets For Perimeter Moldings: Closed-cell foam, factory-applied to molding.
  4. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.
  5. At Curved walls: Provide prefabricated edge moldings to fit radius of curved walls.
- D. Metal Edge Trim for Suspension Systems: Steel or extruded aluminum; provide attachment clips, splice plates, and preformed corner pieces for complete trim system.
  1. Trim Height: 6 inch.
  2. Finish: Baked enamel.
  3. Color: White.
  4. Products:
    - a. Armstrong World Industries; Axiom
    - b. Rockfon; Infinity
    - c. Gordon Inc.; Contura.
    - d. USG Corporation; Compasso Suspension Trim: [www.usg.com/ceilings/#sle](http://www.usg.com/ceilings/#sle).
- E. Touch-up Paint: Type and color to match grid.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.
- C. Examine substrates and structural framing to which ceiling system attaches or abuts with installer present for compliance with requirements specified in this and other sections that affect installation and anchorage of ceiling system.
- D. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.
- C. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

### **3.03 INSTALLATION - SUSPENSION SYSTEM**

- A. Install suspension system in accordance with ASTM C 636/C 636M and ASTM C 636/C 636M and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces, at junctions with other interruptions and where necessary to conceal edges of acoustical units.
  - 1. Sealant Bed: Apply continuous ribbon of acoustical sealant, concealed on back of vertical leg before installing moldings.
  - 2. Use longest practical lengths.
  - 3. Screw-attach moldings to substrate at intervals not over 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to tolerance of 1/8 inch in 12'-0". Miter corners accurately and connect securely.
- D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- E. Install hangers plumb and free from contact with objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying or other equally effective means.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels and install supplemental suspension members and hangers in forms of trapezes or equivalent devices to span the extra distance.
  - 1. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- I. Do not eccentrically load system or induce rotation of runners.
- J. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews or other devices that are secure and appropriate for substrate, and in manner that will not cause deterioration or failure due to age, corrosion or elevated temperatures.
- K. Do not support ceilings directly from permanent metal forms; furnish cast-in-place hanger inserts that extend through forms.
- L. Do not attach hangers to steel roof deck or deck tabs. Attach hangers to structural members.
- M. Space hangers not more than 4'-0" o.c. along each member supported directly from hangers, unless otherwise shown, and provide hangers not more than 8 inches from ends of each member.
- N. Install suspension system runners square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

### **3.04 CLEANING**

- A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings and suspension members. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage.
- B. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

### **END OF SECTION**

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## **SECTION 09 6500 - RESILIENT FLOORING**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.

#### **1.03 RELATED REQUIREMENTS**

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems: Grounding and bonding of static control flooring to building grounding system.

#### **1.04 REFERENCE STANDARDS**

- A. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile 2020.
- B. ASTM F1861 - Standard Specification for Resilient Wall Base 2021.
- C. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings 2011.

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products and accessories, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
  - 1. Submit manufacturers final cleaning instructions and maintenance cleaning instructions with the methods being used for this installation indicated by circling or highlighting. Final cleaning methods are for Architect's information only and are not for approval.
- C. Shop Drawings: Indicate seaming plans and floor patterns. Indicate locations of columns, doorways, enclosing partitions, built-in furniture, cabinets and casework; and cutout locations.
- D. Samples: Submit two samples, illustrating color and pattern for each resilient flooring product specified.
  - 1. Sample size:
    - a. Tiles: Submit full size samples.
    - b. Heat Weld bead: manufacturer's standard-size samples, but not less than 9 inches long, of each color specified.
  - 2. Heat-Welded Seam Samples: Of each heat-welding bead and flooring product, color, and pattern combination required, with seam running lengthwise and in center of 6-by-9-inch sample made and applied to a rigid backing by Installer for this Project.
- E. Test Reports: Indicating vapor emission rate and diagram showing vapor emission test locations and results of relative humidity test.
- F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Flooring Material: of each type, style and color.
    - a. Tiles: two manufacturers containers of each type, color and style of resilient tile installed.

#### **1.06 QUALITY ASSURANCE**

- A. Single Source Responsibility: Obtain each type, color and pattern of resilient flooring and accessory from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

- B. Installer Qualifications: Engage an installer who is experienced in work of similar size and scope.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to project site in manufacturer's original, unopened cartons and containers, each bearing names of products and manufacturer, project identification, and shipping and handling instructions. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- D. Protect roll materials from damage by storing on end.
- E. Store tile on flat surfaces.

#### **1.08 FIELD CONDITIONS**

- A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 65 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F but not greater than 95 degrees F..
- C. Close spaces to traffic during flooring installation and for time period after installation recommended by manufacturer.
- D. Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Do not install resilient flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by resilient flooring manufacturer's recommended bond and moisture test.

#### **1.09 WARRANTY**

- A. Tile: Provide manufacturer's standard warranty for installed flooring, for period of 10 years from date of purchase for materials and for the lifetime of the installed ESD floor for electrical properties from the date of testing and certification by authorized representative of flooring manufacturer.

### **PART 2 PRODUCTS**

#### **2.01 TILE FLOORING**

- A. Luxury Vinyl Tile: Printed film type, with transparent or translucent wear layer.
  - 1. Manufacturers: Basis of Design indicated on Finish Key.
  - 2. Other acceptable Manufacturers: Subject to compliance with requirements provide Basis of Design product(s) or comparable product by one of the following:
    - a. Shaw Industries Group Inc.; [www.shawcontract.com](http://www.shawcontract.com).
    - b. Mohawk Carpet Corporation; [www.mohawkflooring.com/#sle](http://www.mohawkflooring.com/#sle)
    - c. Patcraft by Shaw Industries Group Inc.; [www.patcraft.com/#sle](http://www.patcraft.com/#sle)
    - d. Substitutions: See Section 01 6000 - Common Product Requirements.
  - 3. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
  - 4. Wear Layer Thickness: 0.020 inch.
  - 5. Total Thickness: As indicated on finish key.
  - 6. Pattern and color: As indicated on finish key.

#### **2.02 RESILIENT BASE**

- A. Resilient Base: ASTM F1861, Type TP, rubber, thermoplastic; top set Style B, Cove and / or Style A, Straight as indicated on finish key and as follows:
  - 1. Manufacturers: Basis of Design indicated on Finish Key
    - a. Johnsonite, a Tarkett Company: [www.johnsonite.com/#sle](http://www.johnsonite.com/#sle).
    - b. Roppe Corp: [www.roppe.com/#sle](http://www.roppe.com/#sle).
    - c. Allstate Rubber Corp: [www.allstaterubber.com/#sle](http://www.allstaterubber.com/#sle).



2. Height: 4 inch.
3. Thickness: 0.125 inch.
4. Finish: Satin.
5. Style: B - coved.
6. Length: Minimum 100 foot rolls.
7. Color: As indicated on drawings.
8. Corners: Job Formed

## **2.03 ACCESSORIES**

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
- C. Heat-Welding Bead: Solid-strand product of floor covering manufacturer for heat-welding linoleum seams.
  1. Color: Match color of flooring.
- D. Chemical Bonding Compound: Product of floor covering manufacturer for chemically bonding seams.
- E. Cove Strip: 1-inch-radius support for integral flash cove base provided or approved by floor covering manufacturer.
  1. Filler for Coved Base: Plastic.
- F. Cove-Base Cap Strip: Square metal, vinyl, or rubber cap for integral flash cove base provided or approved by floor covering manufacturer.
- G. Prefabricated Flash Cove Base: Floor covering manufacturer's standard prefabricated units matching floor covering specified.
- H. Adhesive (Cements): Water-resistant, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.
- I. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based formulation provided or approved by floor covering manufacturer for applications indicated.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Do not allow resilient flooring work to proceed until subfloor surfaces are satisfactory.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
  1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
    - a. Treat unsatisfactory surfaces as recommended by manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

### **3.02 PREPARATION**

- A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).
- B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

- C. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- D. Prohibit traffic until filler is fully cured.
- E. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- F. Clean substrate. Broom and vacuum clean substrates to be covered immediately before installing flooring. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Do not proceed with installation until unsatisfactory conditions have been corrected.
- G. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

### **3.03 INSTALLATION - GENERAL**

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
  - 1. Place copper grounding strip in conductive adhesive and apply additional adhesive to top side of strip before installing static control flooring. Allow strip to extend beyond flooring in accordance with static control flooring manufacturer's instructions. Refer to Section 26 0526 for grounding and bonding to building grounding system.
  - 2. Fit joints and butt seams tightly.
  - 3. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- E. Scribe, cut, and fit floor coverings to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- F. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- G. Install floor coverings on recessed floor covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on covers. Tightly adhere edges to perimeter of substrate around covers and to covers.
- H. Roll floor coverings per floor covering manufacturer's written instructions.

### **3.04 INSTALLATION - TILE FLOORING**

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- B. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room area are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise shown.
  - 1. Lay tiles with grain running in one direction.
- C. Adhere tile flooring to substrates using full spread of adhesive applied per flooring manufacturer's directions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
  - 1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- D. Hand roll tiles per tile manufacturer's written instructions.

### **3.05 INSTALLATION - RESILIENT BASE**

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

### **3.06 CLEANING**

- A. Perform the following operations immediately after installing flooring products:
  - 1. Remove adhesive and other surface blemishes using cleaner recommended in writing by floor covering manufacturer.
  - 2. Sweep and vacuum floor thoroughly.
  - 3. Do not wash floor until after time period recommended in writing by floor covering manufacturer.
  - 4. Damp-mop floor to remove marks and soil using method and cleaner per floor covering manufacturer's recommendations.
- B. Protect flooring against mars, marks, indentations, and other 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 floor covering manufacturer.
- C. Clean in accordance with manufacturer's written instructions.
  - 1. Clean resilient flooring not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean floor covering per manufacturer's written recommendations.
    - a. Before cleaning, strip protective floor polish that was applied after completing installation only if required to restore polish finish and if recommended by floor covering manufacturer.
    - b. After cleaning, reapply polish to floor surfaces to restore protective floor finish according to floor covering manufacturer's written recommendations, submitted to Architect as part of the Shop Drawing Phase. Coordinate with Owner's maintenance program.

### **3.07 PROTECTION**

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

### **END OF SECTION**

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## **SECTION 09 6813 - TILE CARPETING**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Extent, location and details for carpet tile are shown on the drawings and in schedules. Work of this section includes carpet and all accessories.

#### **1.03 REFERENCE STANDARDS**

- A. 16 CFR 1630 - Standard for the surface Flammability of Carpets and Rugs (FF 1-70) Current Edition.
- B. CRI 104 - Standard for Installation of Commercial Carpet 2015.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate layout and placement of cut tiles. Indicate pile or pattern direction, start points, and locations and types of edge strips. Indicate columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tile. Show installation details at special conditions.
- C. Product Data: Provide data for each type of carpet tile material and installation accessory required. Submit written data on physical characteristics, durability, fade resistance, and fire test response. Submit methods of installation for each type of substrate.
  - 1. Provide written limits for moisture, alkalinity and internal relative humidity by flooring material manufacturers and adhesive manufacturers being provided for the project.
- D. Samples of verification purposes in manufacturer's standard size, showing full range of colors, texture, and pattern variations expected. Prepare samples from same material to be used for the Work. Submit the following:
  - 1. Full-size carpet tile of each type required.
  - 2. 12-inch-long samples of each type exposed edge stripping and accessory item.
- E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- F. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Materials: Furnished from same production run as each type of carpet tile installed. Package materials with protective covering and identify with labels describing contents. Deliver extra materials to Owner.
    - a. Extra Carpet Tiles: Quantity equal to 2 percent, or one box whichever is greater, of the amount of each type of carpet installed.

#### **1.05 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience.
- B. Single Source Responsibility: Provide material produced by a single manufacturer for each carpet tile type.
- C. Comply with standards, requirements and recommendations of CRI 104.

#### **1.06 DELIVERY, STORAGE, AND PROTECTION**

- A. Deliver materials to project site in original factory wrappings and containers, labeled with identification of manufacturer, brand name, and lot number.
- B. Comply with CRI 104, Section 7: "Site Conditions" and the following. Where the requirements differ comply with the most restrictive of the requirements.

1. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity. Lay flat, blocked off ground.
2. Store materials in area of installation for minimum period of 72 hours prior to installation.
3. Maintain minimum 70 degrees F ambient temperature 48 hours prior to, during and 24 hours after installation.
4. Ventilate installation area during installation and for 72 hours after installation.

#### **1.07 WARRANTY**

- A. Submit a written warranty executed by Contractor, Installer and Manufacturer, agreeing to repair or replace carpet tile which fails in materials or work quality within the specified warranty period. Failures include excessive surface wear, edge ravel, zippering, backing delamination, watermarking, change in physical properties or deterioration of materials and construction beyond normal wear.
  1. Warranty period is five years after the date of Substantial Completion.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Tile Carpeting:
  1. Interface, Inc: [www.interface.com/#sle](http://www.interface.com/#sle).
  2. Mannington Commercial: [www.manningtoncommercial.com#sle](http://www.manningtoncommercial.com#sle).
  3. Mohawk Group: [www.mohawkgroup.com/#sle](http://www.mohawkgroup.com/#sle).

#### **2.02 MATERIALS**

- A. Carpet Tile: Basis of Design indicated on Finish Key.
  1. Basis of Design indicated on Finish Key.
  2. Other acceptable Manufacturers: Subject to compliance with requirements provide Basis of Design product(s) or comparable product by one of the following:
    - a. Shaw Industries Group Inc.; [www.shawcontract.com/#sle](http://www.shawcontract.com/#sle)
    - b. Mohawk Carpet Corporation; [www.mohawkflooring.com/#sle](http://www.mohawkflooring.com/#sle)
    - c. Patcraft by Shaw Industries Group Inc.; [www.patcraft.com/#sle](http://www.patcraft.com/#sle)
    - d. Substitutions: See Section 01 6000 - Common Product Requirements.
- B. Carpet Tile Surface Burning Characteristics: Provide carpet tile identical to that tested for the following fire performance characteristics, per test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify carpet tile with appropriate markings of applicable testing and inspecting organization.
  1. Provide only carpet which has been tested and passes the Federal Flammability Standard 16 CFR 1630 (the pill test).
  2. Rating: Pass.

#### **2.03 ACCESSORIES**

- A. Carpet Edge Guard: Extruded or molded heavy-duty vinyl or rubber of size and profile indicated; minimum 2-inch-wide anchorage flange; colors as selected by Architect from manufacturer's standard color range.
- B. Trowelable Underlayments and Patching Compounds: As recommended by carpet manufacturer.
- C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
  - 1. Test in accordance with Section 09 0561 - Common Work Results for Flooring Preparation.
  - 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
  - 3. Follow moisture and alkalinity remediation procedures in Section 09 0561 - Common Work Results for Flooring Preparation.
- D. Verify that required floor-mounted utilities are in correct location.

### **3.02 PREPARATION**

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Level subfloor within 1/4 inch in 10 feet, noncumulative, in all directions. Sand or grind protrusions, bumps, and ridges. Patch and repair rough areas. Fill depressions.
  - 1. Use leveling and patching compounds to fill cracks, holes, depressions in subfloor as recommended by manufacturer.
  - 2. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
  - 3. When substrates require vapor emission floor treatment, apply leveling and patching compounds after floor treatment.
- C. Clear away debris and scrape up cementitious deposits, existing adhesive, and other detrimental materials, from concrete surfaces to receive carpet tile.
- D. Broom, vacuum, and otherwise clean subfloors to be covered with carpet tile in manner recommended by carpet tile manufacturer.
- E. Apply primer/sealer to concrete floor slab substrate as recommended by manufacturer. Primer/sealer shall be compatible with adhesive applied to carpet tile.

### **3.03 INSTALLATION**

- A. Do not allow carpet tile work to proceed until subfloor surfaces are satisfactory.
- B. Starting installation constitutes acceptance of subfloor conditions.
- C. Install carpet tile in accordance with manufacturer's instructions and CRI 104 (Commercial).
- D. Maintain uniformity of carpet direction and lay of pile, unless otherwise indicated.
- E. Blend carpet from different cartons to ensure minimal variation in color match.
- F. Dry-fit sections of carpet tile prior to application of releasable adhesive.
- G. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps. Extend carpet tile under removable flanges and furnishings and into alcoves and closets of each space.
- H. Lay carpet tile in pattern indicated on Drawings.
- I. Apply releasable adhesive uniformly to substrate per manufacturer's instructions. Butt edges tight to form seams without gaps.
- J. Install carpet edge guard where edge of carpet tile is exposed; anchor guards to substrate.
- K. Trim carpet tile neatly at walls and around interruptions.
- L. Complete installation of edge strips, concealing exposed edges.

### **3.04 CLEANING**

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces, using manufacturers recommended cleaning practices.
- B. Remove and dispose of debris and unusable scraps.
- C. Clean and vacuum carpet surfaces. Using commercial machine having face-beater element. Remove soil. Replace carpet tiles where soil cannot be removed. Remove protruding face yarn.

- D. Provide final protection and maintain conditions, in manner acceptable to manufacturer and installer, to ensure carpet tile is not damaged or deteriorated at time of Substantial Completion. Do not use plastic coverings as they may retard the proper curing of adhesives. Comply with recommendations of CRI 104.

**END OF SECTION**



## **SECTION 09 6900 - ACCESS FLOORING**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made a part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Components required to patch and repair existing adjustable height access flooring systems.

#### **1.03 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- B. Cisca (AF) - Recommended Test Procedures for Access Floors 2016.
- C. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets including loading capacities, materials, finishes, dimensions of components, profiles, and accessories.
- C. Shop Drawings: Indicate floor layout, appurtenances or interruptions, edge details, <>.
  - 1. Delegated Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
    - a. Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
      - 1) Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
      - 2) Show design assumptions, basis of sizing members, connections and other information as necessary, and as may be required including load calculations at points of attachment to building structure, deflection and movement.
      - 3) Clearly show basis of compliance with performance criteria.
      - 4) Include required product data and shop drawings.
      - 5) Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
      - 6) Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 6000 - Common Product Requirements, for additional provisions.
  - 2. Extra Floor Panels: Four of each size and type.
  - 3. Extra Pedestals : Four of each for each system as applicable to system.
  - 4. Panel Lifting Devices: One, of manufacturer's standard type.

#### **1.05 QUALITY ASSURANCE**

- A. Designer Qualifications: Design floor system structure layout for this project under direct supervision of a Professional Structural Engineer experienced in design of floors of the type required and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing the type of work required in this section and approved by access flooring manufacturer.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Basis of Design: Match existing
  - 1. Existing system is Global IFS; TecCrete Cornerlock System. Verify in field whether it is 1250 system or 1500SL system.
    - a. Contact for existing system: Brian Vogel; ph# 313-701-9435

### **2.02 PERFORMANCE REQUIREMENTS**

- A. General: Comply with the following system requirements and as indicated for specified components.
  - 1. Test in accordance with CISCA (AF).
  - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
  - 3. Structural Design Live Loads: Comply with requirements of ICC (IBC).
    - a. Uniformly Distributed Loads: In compliance with MBC Table 1607.1, for access floor systems.
      - 1) Office Use: 50 pounds per sq ft.
      - 2) Computer Use: 100 pounds per sq ft.
    - b. Concentrated Loads: Over an area of 2.5 feet by 2.5 feet, 2000 pounds minimum, in compliance with MBC Table 1607.1, for access floor systems.
  - 4. Lateral Stability: Design system for lateral stability in all directions, with or without panels in place.

### **2.03 ACCESS FLOORING - ADJUSTABLE HEIGHT**

- A. Factory-fabricated system consisting of removable floor panels and supporting understructure that allows access to space below floor without requiring removal of panels other than the one directly above the space to which access is needed; provide components and accessories required for complete installation.
- B. Finished Floor Elevation: As indicated on Drawings.
- C. Configuration:
  - 1. Bolted panels on stringerless understructure.
- D. Components:
  - 1. Pedestal Assembly:
    - a. Material: Steel.
    - b. Finish: Galvanized.
    - c. Base: Manufacturer's standard shape and size in accordance with system performance requirements.
    - d. Column: Threaded supporting rod to permit 1 inch adjustment.
    - e. Head: Manufacturer's standard shape and size to accept specified configuration.
    - f. Maximum Pedestal Axial Load: 5000 pounds without permanent deformation, when tested in accordance with CISCA (AF).
  - 2. Floor Panels:
    - a. Construction:
      - 1) Steel pan with exposed lightweight concrete fill.
  - 3. Floor Covering: Field applied, as indicated on Finish Key.

### **2.04 ACCESSORIES - ADJUSTABLE HEIGHT**

- A. Sealant: Any water-based, moisture-curing, or chemically-curing joint sealant suitable for purpose and compatible with materials being sealed; except acrylic latex emulsion.

### **2.05 FABRICATION**

- A. Fabrication Tolerances:
  - 1. Floor Panel Flatness: Plus or minus 0.02 inch in any direction.
  - 2. Floor Panel Width or Length From Specified Size: Plus or minus 0.015 inch.

3. Floor Panel Squareness: Plus or minus 0.015 inch difference between opposite diagonal dimensions.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify field measurements are as indicated on shop drawings.
- B. Verify that substrates comply with tolerances, dimensioned clearances, and other requirements specified in other sections, and that substrates are clean, dry, and free of conditions and deleterious substances that might interfere with system installation.
- C. Verify that required utilities are available, in proper location, and are ready for use.
- D. Start of installation constitutes acceptance of project conditions.

#### **3.02 PREPARATION**

- A. Vacuum clean substrate surfaces.

#### **3.03 INSTALLATION - ADJUSTABLE HEIGHT ACCESS FLOORING**

- A. Install components in accordance with manufacturer's instructions.
- B. Secure pedestal base plate to subfloor with adhesive.
- C. Install floor panels on pedestals with full bearing.
- D. Cut holes in floor panels to accommodate Owner equipment as indicated on drawings. Provide cable cut-out protection.
- E. Provide gaskets and sealant to ensure airtight seal where holes are cut in elevated floor for penetration of cable.

#### **3.04 TOLERANCES**

- A. Maximum Out of Level Floor Panel Tolerance: 1/16 inch in 10 ft, non-cumulative.

#### **3.05 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

#### **3.06 ADJUSTING**

- A. Adjust pedestals to achieve a level floor and to assure adjacent floor panel surfaces are flush.

#### **3.07 CLOSEOUT ACTIVITIES**

- A. Demonstration and Training:
  1. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain access flooring system.
  2. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
  3. Provide minimum of two hours of training.
  4. Instructor: Manufacturer's training personnel.
  5. Location: At project site.

#### **3.08 PROTECTION**

- A. Do not permit traffic over unprotected floor surface.

#### **END OF SECTION**

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## **SECTION 09 8430 - SOUND-ABSORBING WALL AND CEILING UNITS**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Sound-absorbing ceiling panels.
- B. Sound-absorbing ceiling baffles.
- C. Mounting accessories.

#### **1.03 REFERENCE STANDARDS**

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- B. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each sound-absorptive system component and installation accessory required, including installation methods for each type of substrate. Provide written data on each required component including physical characteristics, such as durability, resistance to fading, and flame resistance.
- C. Shop Drawings: Fabrication and installation details, panel layout, and fabric orientation. Show locations and extent of systems.
- D. Samples: Fabricated samples of each type of panel listed on Finish Key; 6 by 6 inch, showing construction, edge details, and fabric covering.
- E. Samples: Fabricated samples of acoustical baffles listed on Finish Key; 6 by 6 inch, showing construction, edge details, and fabric covering.
- F. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.
- G. Cleaning and Maintenance Instructions: Provide the manufacturer's instructions for cleaning and maintenance of installed work.
  - 1. Include recommended methods and frequency for maintaining optimum condition under anticipated use conditions.
  - 2. Include precautions against cleaning materials and methods detrimental to finished surface and performance.

#### **1.05 QUALITY ASSURANCE**

- A. Single Source Responsibility: Obtain each color, grade, finish and type of wall panel surface system components from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of work.
- B. Manufacturer Qualifications: Company with not less than five years of experience in manufacturing acoustical products similar to those specified.

## **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles, clearly labeled with identification of manufacturer, brand name, quality or grade, and fire hazard classifications; do not open bundles until units are needed for installation.
- B. Store sound-absorptive panel materials in original undamaged packages and containers inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
  - 1. Maintain room temperature within storage area at temperature recommended by panel manufacturer. Keep material out of direct sunlight to avoid surface distortion.
- C. Protect edges from damage.
- D. Space Enclosure: Do not install sound-absorptive panels until wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

## **PART 2 PRODUCTS**

### **2.01 FELT SOUND-ABSORBING CEILING UNITS**

- A. Provide products as indicated on Finish Key
- B. General:
  - 1. Prefinished, factory assembled fabric-covered panels.
  - 2. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- C. Felt Acoustical Panels for Ceilings:
  - 1. Noise Reduction Coefficient (NRC): 1.0 when tested in accordance with ASTM C423 for Type E-400 mounting, per ASTM E795.
  - 2. Panel Size: As indicated on Finish Key.
  - 3. Panel Thickness: As indicated on Finish Key.
  - 4. Edges: Exposed Felt
  - 5. Corners: Mitered.
  - 6. Color: As indicated on Finish Key.
  - 7. Mounting Method: Lay-in panel with magnetic connection for suspended ceiling system, exposed grid.
    - a. Suspension System: Specified in Section 09 5100 - Acoustical Ceilings.
- D. Felt Acoustical Ceiling Baffles:
  - 1. Baffle Size: As indicated on Finish Key
  - 2. Baffle Thickness: As indicated on Finish Key.
  - 3. Color: As indicated on Finish Key.
  - 4. Mounting: Vertically suspended from ceiling or structure through Feltlock connections.

### **2.02 ACCESSORIES**

- A. Mounting Accessories: Manufacturer's recommended accessories at locations as indicated on each acoustical unit, for mounting type indicated, and sized appropriately for weight of acoustical unit.
- B. Slotted Channel Framing: Cold-formed metal channels with flange edges returned towards web.
  - 1. Basis of Design: Unistrut: P1000 Series;
    - a. Channel Width: 1-5/8
    - b. Channel Depth: As required
    - c. Metal and Thickness: Galvanized steel per ASTM A1011/A1011M, structural quality, Grade 33, ASTM A653/A653M G90 coating; 0.105 inch nominal thickness.
    - d. Finish: Pre-galvanize prior to roll forming.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 1. Report unsatisfactory conditions to General Contractor in writing.
  - 2. Finishing operations shall be complete, including painting, before beginning installation of sound-absorptive panel system materials.
  - 3. Wall surfaces to receive sound-absorptive panels shall be dry and free from dirt, grease, loose paint and scale.

### **3.02 INSTALLATION**

- A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.
- B. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.
- C. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
  - 1. Plumb and level.
  - 2. Flatness.
  - 3. Width of joints.

### **3.03 CLEANING**

- A. Clean fabric facing upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

### **3.04 PROTECTION**

- A. Provide protection of installed acoustical panels until Date of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

### **END OF SECTION**

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## SECTION 09 9100 - PAINTING

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### 1.02 SECTION INCLUDES

- A. Extent of painting work is shown on Drawings and Schedules and by provisions of this Section.
- B. Work includes surface preparation, painting and finishing of interior and exterior items and surfaces throughout project, except as otherwise indicated.
1. Surface preparation, priming and finish coats of paint specified in this Section are in addition to shop-priming and surface treatment specified under other Sections.
- C. "Paint" includes coating systems materials, primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- D. Paint exposed surfaces whether or not colors or finishes are designated in "schedules", except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces.
1. Painting includes field painting exposed bare and covered (insulated) pipes and ducts, hangers, exposed steel and iron equipment, including sprinkler piping except as otherwise indicated. Do not paint pipe markers, color coded banding tape, pipe/duct tags, stenciled identification. Where piping and ductwork are to be painted to meet facilities color coding standard, paint surfaces according to color guidelines in Division 22 and 23, using paint systems and preparation designated in this Section.
2. If color of finish is not designated, the Architect will select from colors or finishes specified.
- E. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts and labels.
1. Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

#### 1.03 REFERENCES

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2019.
- C. ASTM D523 - Standard Test Method for Specular Gloss 2014 (Reapproved 2018).
- D. SSPC-SP 6 - Commercial Blast Cleaning 2007.

#### 1.04 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D16 apply to this Section.
- B. Sheen: As defined by the Master Painters Institute (MPI).
1. Wherever reference is made to sheen finish or gloss, provide reflectivity, when measured with a gloss meter per ASTM D523, as follows for each designation:

	Designation	60 degree units	85 degree units
Level 1	Flat	5 maximum	10 maximum
Level 2	Velvet	10 maximum	10 to 35
Level 3	Eggshell	10 to 25	10 to 35
Level 4	Satin	20 to 35	35 minimum
Level 5	Semi-gloss	35 to 70	N/A
Level 6	Gloss	70 to 85	N/A

Level 7	High Gloss	greater than 85	N/A
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#### 1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit product data for each paint system specified including block fillers and primers.
  - 1. Provide manufacturer's technical information including label analysis and instructions for handling, storage and application of each material proposed for use.
  - 2. List each material and cross-reference the specific coating, finish system and application. Identify each material by the manufacturer's catalog number and general classification.
  - 3. Provide certification by manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC's).
- C. Samples for Initial Verification Purposes: Provide samples of each color, sheen and material to be applied, with texture to simulate actual conditions, on 12 inch by 12 inch card stock.
  - 1. Samples submitted must be dry.
  - 2. Resubmit until required color, sheen and texture is achieved.
  - 3. Do not order paint materials until Architect has reviewed and accepted samples for initial verification.

#### 1.06 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide primers and undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.

#### 1.07 FIELD SAMPLES

- A. Field Samples: On wall surfaces and other exterior and interior components, duplicate finishes of prepared samples.
  - 1. Provide full-coat finish samples on minimum 100 sq. ft. of surface until required sheen, color, and texture are obtained; simulate finished lighting conditions for review of in-place work.
  - 2. Final acceptance of colors will be from field samples.
  - 3. Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted.
    - a. Apply coatings in room or surface in accordance with schedule or as specified.
    - b. After finishes are accepted, room or surface will be used for evaluation of coating systems of a similar nature.

#### 1.08 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver materials to job site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
  - 1. Product name or title of material.
  - 2. Product description (generic classification or binder type).
  - 3. Federal Specification number, if applicable.
  - 4. Manufacturer's stock number and date of manufacture.
  - 5. Contents by volume, for pigment and vehicle constituents.
  - 6. Thinning instructions.
  - 7. Application instructions.
  - 8. Color name and number.
- B. Store materials not in use in tightly covered containers in well ventilated area at minimum ambient temperature of 45 degF. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
  - 1. Protect from freezing. Keep storage areas neat and orderly. Remove oily rags and water daily. Take necessary measures to ensure workers and work areas are protected from fire and health hazards resulting from handling, mixing and application.

## **1.09 ENVIRONMENTAL REQUIREMENTS**

- A. Apply water-based paints only when temperature of surfaces to be painted and surrounding air temperature are between 50 degF and 90 degF.
- B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperature are between 45 degF and 95 degF.
- C. Do not apply paint in snow, rain, fog or mist, when relative humidity exceeds 85 percent, at temperatures less than 5 degF above the dew point, or to damp or wet surfaces.
  - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.
- D. Do not apply paint where conditions of airborne debris or contamination exist or could exist.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. The University has standardized on particular products they use for maintaining their facilities. Provide products indicated below.
- B. Manufacturers: Subject to compliance with requirements including color selection, provide products of one of the following.
  - 1. The Sherwin-Williams Co.(SW) per CMU Standard.
- C. Substitutions: Not permitted.

### **2.02 MATERIALS**

- A. Material Compatibility: Provide block fillers, primers, finish coat materials and related materials compatible with one another and the substrates indicated under conditions of service and application as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.
- C. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.
- D. Colors: Acceptability of any manufacturer is contingent upon availability of colors, sheens and textures matching those indicated on Room Finish Schedule as acceptable to Architect.
- E. Volatile Organic Compound (VOC) Content:
  - 1. Provide coatings that comply with the most stringent requirements specified in the following:
    - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
    - b. Architectural coatings VOC limits of State in which the project is located.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint must be thoroughly dry before paint is applied.
  - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected.
  - 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
  - 1. Notify Architect about anticipated problems using materials specified over substrates primed by others.

### 3.02 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures and similar items already installed that are not to be painted. Where removal is not practical, provide surface-applied protection prior to surface preparation and painting.
  - 1. Remove mirrors and display cabinets, chalkboard, markerboards, tackboards and other surface mounted accessories in corridors and public spaces prior to painting. Paint all surfaces concealed behind such accessories.
  - 2. When painting latex paint. Protect all doors and frames to prevent latex paint from getting on areas that are to receive Alkyd paint.
  - 3. The University recommends that walls and ceilings are patched and painted first, allowed to dry. The masking and protection removed and then the doors and frames are painted.
  - 4. Cover the floors with drop cloths or paper to protect floor finishes from paint and overspray.
  - 5. Remove ventilation covers/grilles (mainly encountered in the suite bathrooms) prior to painting.
  - 6. Remove receptacle and light switch covers prior to painting. Mask off electrical boxes, once covers are removed to prevent paint from getting inside boxes. Remove protection and replace covers once paint has completely dried.
  - 7. Do not remove Underwriter's Laboratories, Factory Mutual or other code-required labels or equipment names, identification, performance rating or nomenclature plates.
  - 8. Protect adjacent surfaces with suitable covering or other method during work progress. Mask, or protect with suitable coverings, sealing and glazing compound, glass, gauges, moving parts of machinery and other mechanical equipment such as valve stems, sprinkler heads and similar items.
  - 9. After completion of painting operations, reinstall items removed using workers skilled in trades involved.
- B. Specific:
  - 1. Bathroom ceilings: Clean to remove any stains and wipe down to remove any dust and other contaminants prior to painting.
  - 2. Re-caulk where painted surface meets ceramic tile, if caulking is damaged, prior to re-painting.
  - 3. Where floor covering is not scheduled to be replaced protect rubber/vinyl wall base from painting.
  - 4. Where floor covering is scheduled to be replaced, remove the vinyl/rubber base before painting.
  - 5. Painter is responsible for protecting hardware when painting doors. If not protected adequately and hardware is painted, to any degree, hardware is to be replaced at painters expense.
  - 6. Bag the wireless access points to protect during painting.
- C. Cleaning: Before applying paint or other surface treatments, clean new and previously painted (existing) substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning.
  - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- D. Surface Preparation: Clean and prepare surfaces to be painted in conformance with manufacturer's instructions for each particular substrate condition and specified.
  - 1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing about anticipated problems using specified finish-coat material with substrates primed by others.
  - 2. Cementitious Materials: Prepare concrete and concrete masonry surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils and release agents. Roughen as required to remove glaze. If hardeners and sealers have been used to improve curing, use mechanical methods of surface preparation.

- a. Scrape to remove high spots and detritus. Wipe down surfaces and apply sealant (caulk) cracks and other holes.
  - b. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods in compliance with the Society for Protective Coatings recommendations.
  - a. Clean steel surfaces as recommended by paint system manufacturer and the requirements of SSPC-SP 6.
  - b. Touch up bare areas and damaged shop-applied prime coats. Wire brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as shop coat.
- E. Materials Preparation: Carefully mix and prepare paint materials per manufacturer's directions.
  1. Maintain containers used in mixing and applying paint in clean condition, free of foreign materials and residue.
  2. Stir material before application to produce a mixture of uniform density; stir as required during application.
    - a. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
  3. Use only thinners approved by painting manufacturer and only within recommended limits.
- F. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match color of finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

### 3.03 APPLICATION

- A. Apply paint per manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces or conditions detrimental to formulation of a durable paint film.
  1. Paint colors, surface treatments and finishes as indicated in schedules.
  2. Provide finish coats compatible with primers used.
  3. The number of coats and film thickness required is the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by the manufacturer.
    - a. Sand between applications where sanding is required to produce an even smooth surface per manufacturer's directions.
    - b. Give special attention to ensure surfaces, including edges, corners, crevices, welds and exposed fasteners receive a dry film thickness equivalent to flat surfaces.
  4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convactor covers, covers for finned tube radiation, grilles and similar components are in place. Extend coatings in these areas as required to maintain system integrity and provide desired protection.
  5. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  6. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular black paint.
  7. Paint backside of access panels and removable or hinged covers to match exposed surfaces.
  8. Finish exterior doors on tops, bottoms and side edges same as exterior faces.
  9. Sand lightly between each succeeding coat.
- C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
    - a. Sand between applications where sanding is required to produce an even smooth surface per manufacturer's directions.
  2. Omit primer on metal surfaces that have been shop primed and touch up painted.
    - a. At existing, previously painted surfaces, apply finish coats only.
  3. Apply additional coats if undercoats, stains, and other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance.
    - a. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to flat surfaces.
  4. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky or moderate thumb pressure and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- D. Application Procedures: Apply paints and coating by brush, roller, spray or other applicators per manufacturer's directions.
1. Metal Door Frames: Brush with a fine bristle high quality brush.
  2. Metal Doors: Roll with a fine nap roller or spray apply.
  3. CMU and Gypsum board walls: Spray apply.
- E. Minimum Coating Thickness: Apply materials no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of entire system as recommended by manufacturer.
- F. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to items without factory finish exposed in occupied spaces.
- G. Block Fillers: Apply block fillers to concrete masonry block at rate to ensure complete coverage with pores filled.
- H. Prime Coats: Before applying finish coats, apply a prime coat of material as recommended by manufacturer to material required to be painted or finished and not prime coated by others.
1. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to assure a finish coat with no burn through or other defects due to insufficient sealing.
- I. Pigmented (Opaque) Finishes: Completely cover to provide a smooth opaque surface of uniform finish, color, appearance and coverage.
1. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.
- J. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster.
1. Laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections will not be acceptable.
  2. Provide satin finish for final coat.
- K. Completed Work: Match approved samples for color, sheen texture and coverage. Remove, refinish or repaint work not complying with specified requirements.

### **3.04 CLEANING AND PROTECTION**

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish and other discarded paint materials from the site.
1. After completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.
- B. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting as acceptable to Architect.

- C. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
  - 1. At completion of construction activities of other trades, touchup and restore damaged or defaced painted surfaces.

### **3.05 INTERIOR PAINT SCHEDULE**

- A. General: Provide the following paint systems for the various substrates indicated.
- B. Gypsum Wall Board:
  - 1. Flat Acrylic Finish: 2 finish coats over a primer.
    - a. Primer (New gypsumboard): Latex-based, interior primer applied at spreading rate recommended by manufacturer to achieve a total dry film thickness not less than that recommended by the manufacturer.
      - 1) SW: ProMar 200 0 VOC Primer B28 Series
    - b. Primer (existing previously painted gypsumboard): Latex-based, interior primer applied at spreading rate recommended by manufacturer to achieve a total dry film thickness not less than that recommended by the manufacturer.
      - 1) SW: ProMar 200 0 VOC Primer B28 Series
    - c. First and Second Coats: Flat acrylic-latex, interior enamel applied at spreading rate recommended by manufacturer to achieve a total dry film thickness not less than that recommended by the manufacturer.
      - 1) SW: ProMar 200 Zero VOC Interior Flat B30 Series
  - 2. Lo-Lustre Acrylic-Enamel Finish: 2 finish coats over a primer.
    - a. Primer (New gypsumboard): Latex-based, interior primer applied at spreading rate recommended by manufacturer to achieve a total dry film thickness not less than that recommended by the manufacturer.
      - 1) SW: ProMar 200 0 VOC Primer B28 Series
    - b. Primer (existing previously painted gypsumboard): Latex-based, interior primer applied at spreading rate recommended by manufacturer to achieve a total dry film thickness not less than that recommended by the manufacturer.
    - c. First and Second Coats: Low-luster eggshell, acrylic-latex, interior enamel applied at spreading rate recommended by manufacturer to achieve a total dry film thickness not less than 9.2 mils.
      - 1) Moore: Ultra Spec 500 Low Sheen N537
- C. Ferrous and Zinc Coated Metal:
  - 1. Semi-Gloss Alkyd Enamel Finish: Two finish coats over primer.
    - a. Prime Coat (Use at new and previously unpainted metals): Quick-drying, rust inhibitive, acrylic latex based primer, as recommended by manufacturer, applied at spreading rate to achieve a total dry film thickness not less than that recommended by the manufacturer.
      - 1) S-W: ProCryl Universal Primer B66-310 Series.
    - b. First and Second Coats: Low odor, semi-gloss, alkyd enamel applied at spreading recommended by manufacturer to achieve a total dry film thickness not less than that recommended by the manufacturer.
      - 1) S-W: Industrial Enamel Semi-Gloss B54 Series

**END OF SECTION**

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## **SECTION 10 1443 - INTERIOR SIGNAGE**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Toilet room signs.
- B. Tactile Exit Signs
- C. Other Code required signage as indicated on Drawings
- D. Room and door signs.

#### **1.03 REFERENCE STANDARDS**

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.
- B. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Shop Drawings: Provide shop drawings for fabrication and erection of signs. Include plans, elevations and large-scale sections of typical members and other components. Show anchors, grounds, reinforcement, accessories, layout and installation details.
  - 1. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.
- B. Single-Source Responsibility: For each separate type of sign, required, obtain signs from one source from a single manufacturer.
- C. Design Criteria: The drawings indicate size, profiles, and dimensional requirements of signs and are based on the specific type and model indicated.
  - 1. Signs by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect.
  - 2. The burden of proof of equality is on the proposer.
- D. Code Compliance: All signs must meet the requirements of the current ADAAG, effective March 2011 and Michigan Barrier free design laws.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

## **1.07 PROJECT CONDITIONS**

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress.

## **1.08 FIELD CONDITIONS**

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Flat Signs:
  - 1. 2/90 Sign Systems
  - 2. APCO Graphics, Inc.
  - 3. ASI Sign Systems, Inc.
  - 4. Inpro: [www.inprocorp.com/#sle](http://www.inprocorp.com/#sle).
  - 5. Takeform

### **2.02 SIGNAGE APPLICATIONS**

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room and Door Signs:
  - 1. Sign Type: Flat signs with applied character panel media as specified.
  - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
  - 3. Character Height: 1 inch.
  - 4. Sign Height: 2 inches, unless otherwise indicated.

### **2.03 SIGN TYPES**

- A. Flat Signs: Signage media without frame.
  - 1. Edges: Eased for safety.
  - 2. Corners: As indicated on Drawings.
  - 3. Sign Face Material: As indicated on Drawings
  - 4. Symbol Panel Material: As indicated on Drawings
  - 5. Typeface Material: Rowmark Acrylic
  - 6. Wall Mounting of One-Sided Signs: Tape adhesive.
- B. Color and Font: Unless otherwise indicated:
  - 1. Character Font: As indicated on Drawings.
  - 2. Character Case: As indicated on Drawings
  - 3. Background Color: As indicated on Drawings.
  - 4. Character Color: As indicated on Drawings

### **2.04 ACCESSORIES**

- A. Tape Adhesive: Double sided tape, permanent adhesive.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrate surfaces are ready to receive work.

### **3.02 INSTALLATION**

- A. Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
- B. Install signage level, plumb and at height in compliance with ADA requirements. Signage surfaces shall be free from distortion or other defects in appearance.

- C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1. Align edge of signage 2 inches from edge of door jamb, inless otherwise indicated or required for compliance with ADA standards and ICC A117.1. Use mounting method indicated.
- D. At completion of the installation, clean soiled sign surfaces per manufacturer's instructions. Protect from damage until Substantial Completion; repair or replace damaged items. Replace all damaged defective signs with new units.

**END OF SECTION**

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## **SECTION 10 2113.19 - PLASTIC TOILET COMPARTMENTS**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Solid plastic toilet compartments.
- B. Vestibule screens.

#### **1.03 REFERENCE STANDARDS**

- A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2023.
- B. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth 2019.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.
- B. Field Measurements: Verify dimensions by field measurements before fabrication and show recorded measurements on Shop Drawings.
  - 1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication without field measurements. Coordinate construction to ensure actual dimensions correspond to guaranteed dimensions.
- C. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each type and style of compartment provide data on panel construction, hardware, and accessories.
- C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall, floor, and ceiling supports, door swings. Show locations of cutouts for compartment-mounted toilet accessories.
- D. Samples: Submit two sets of samples of partition panel material, 3 by 3 inch in size illustrating full range of panel finish, color, and sheen available.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Solid Plastic Toilet Compartments:
  - 1. ASI Accurate Partitions: [www.asi-accuratepartitions.com/#sle](http://www.asi-accuratepartitions.com/#sle).
  - 2. ASI Global Partitions: [www.asi-globalpartitions.com/#sle](http://www.asi-globalpartitions.com/#sle).
  - 3. Hadrian: [www.hadrian-inc.com/#sle](http://www.hadrian-inc.com/#sle).
  - 4. Metpar Corp: [www.metpar.com](http://www.metpar.com).

#### **2.02 PLASTIC TOILET COMPARTMENTS**

- A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-to-ceiling anchored.
  - 1. Color: Slate.
- B. Doors:
  - 1. Thickness: 1 inch.
  - 2. Width: 36 inch.
  - 3. Width for Handicapped Use: 36 inch with minimum 32 inch clear opening, out-swinging.

- 4. Height: 55 inch.
- C. Panels:
  - 1. Thickness: 1 inch.
  - 2. Height: 55 inch.
- D. Pilasters:
  - 1. Thickness: 1 inch.
  - 2. Width: As required to fit space; minimum 3 inch.

## **2.03 FABRICATION**

- A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.
  - 1. Provide aluminum heat-sink strips at exposed bottom edges of HDPE units to prevent burning.
- B. Furnish units with cut-outs, drilled holes, and internal reinforcement to receive partition mounted hardware, accessories, and grab bars, as indicated.
- C. Floor-Mounted, Headrail (Overhead)-Braced Compartments: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

## **2.04 ACCESSORIES**

- A. Pilaster Shoes: Formed ASTM A666 Type 304 stainless steel with No. 4 finish, 3 inch high, concealing floor fastenings.
  - 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Extruded aluminum, anti-grip profile.
  - 1. Size: Manufacturer's standard size.
- C. Brackets: Anodized aluminum; manufacturer's standard type for conditions indicated on drawings.
- D. Attachments, Screws, and Bolts: Stainless steel.
  - 1. For attaching panels and pilasters to brackets: Through-bolts and nuts.
- E. Hinges: Anodized aluminum, manufacturer's standard finish.
  - 1. 8 Inch wrap-around hinge; three per door.
- F. Door Hardware: Chromium-plated brass, manufacturer's standard finish.
  - 1. Door Latch: Thumb turn or sliding door latch with exterior emergency access feature.
  - 2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
  - 3. Provide door pull for outswinging doors.
  - 4. Provide door pulls on both sides of all barrier free and ambulatory stall doors.
- G. Coat Hook with Rubber Bumper: One per compartment, mounted on door.
  - 1. Provide two hooks at barrier free compartments. Mount one hook at barrier free height, one hook at standard height.
- H. Provide door pull for outswinging doors.
- I. Provide door pulls on both sides of all barrier free and ambulatory stall doors.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that field measurements are as indicated.
- C. Verify correct spacing of and between plumbing fixtures.

- D. Verify correct location of built-in framing, anchorage, and bracing.

### **3.02 INSTALLATION**

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
  - 1. Locate brackets so anchors occur in tile/masonry joints.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.
- F. Floor-Mounted, Headrail (Overhead)-Braced Compartments: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than 2 fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

### **3.03 TOLERANCES**

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

### **3.04 ADJUSTING**

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

### **3.05 CLEANING AND PROTECTION**

- A. Clean exposed surfaces using materials and methods recommended by partition manufacturer.
- B. Field touch-up of scratches or damaged enamel finish will not be permitted. Replace damaged or scratched materials with new materials.
- C. Provide final protection and maintain conditions to ensure toilet compartments and screens are without damage or deterioration at time of Substantial Completion.

### **END OF SECTION**

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## **SECTION 10 2219 - DEMOUNTABLE PARTITIONS**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Modular Walls, including but not limited to:
  - 1. Associated raceway, boxes, connections and wiring for electrical power switches.
  - 2. Associated raceway and boxes for computer/data cabling and telecommunications.
  - 3. Doors, frames, hardware locksets and passage sets in modular walls.
  - 4. Pre-glazed panels in modular wall.
- B. Gypsum board partition panels.
- C. Frames for doors and glazed openings.
- D. Doors and door hardware.
- E. Glazing.

#### **1.03 REFERENCE STANDARDS**

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.
- C. ASTM E72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction 2022.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.
- E. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).
- F. ASTM E413 - Classification for Rating Sound Insulation 2022.
- G. NEMA LD 3 - High-Pressure Decorative Laminates 2005.

#### **1.04 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on demountable partition system, including fabrication specifications. Provide test data from independent testing agencies demonstrating compliance with performance requirements.
- C. Shop Drawings: Indicate layout and module joint locations.
- D. Samples: Submit two samples 3 by 3 inch in size illustrating wall covering facing and trim colors and finish.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than ten years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience and approved by manufacturer.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Deliver modular wall components boxed or crated to provide protection during transit and job site storage.
- B. Store materials in dry, protected areas in which it is possible to maintain a constant minimum temperatures in accordance with manufacturers written instructions.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Demountable Partition System:
  - 1. Basis of Design: Trendway Architectural product, a Division of Fellowes Contract Interiors; Volo Wall
  - 2. Other Acceptable Manufacturers: Subject to compliance with requirements provide Basis of Design system or comparable system by one of the following:
    - a. Haworth
    - b. KI
    - c. Steelcase

### **2.02 DEMOUNTABLE GYPSUM BOARD PARTITIONS**

- A. Partition System: Factory laminated and factory assembled, non-progressive modular walls complete with finished floor and ceiling channels, vertical support framing, glazing framing and stops, anchorage and accessories.
  - 1. Module Width: As indicated on drawings.
  - 2. Partition Height: As indicated on drawings.
  - 3. Nominal Partition Thickness: 2-1/4 inches.
  - 4. Joints: Vertical, butt joint.
  - 5. Utility Raceways: Provide access through vertical support profiles and floor and base channels.
    - a. Base: 6 inch aluminum base. Locate receptacles as indicated on Drawings.
- B. Performance Requirements:
  - 1. Acoustic Attenuation:
    - a. Glass Panels: STC of 30 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
    - b. Solid 3/4 inch panel inserts: STC of 42 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
  - 2. Flamespread index, ASTM E84: Not greater than 200.
  - 3. Smoke Developed index, ASTM E84: Not greater than 250.
  - 4. Deflection due to transverse loading, ASTM E72: Deflection not greater than 1/120th of the vertical span at loads of 5 pounds per square foot transverse loading.

### **2.03 MATERIALS**

- A. Aluminum Extrusions: ASTM B221 (ASTM B221M).
- B. Glazing: Manufacturer's standard vision and back painted glass. Refer to Drawings.
- C. Plastic Laminate: NEMA LD 3, HGS.
  - 1. Color and Finish: As indicated on Drawings.
- D. Tackable Panels: Manufacturers standard. Color and fabric as indicated on Drawings.
- E. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- F. Fasteners: Type recommended by system manufacturer.

### **2.04 PARTITION COMPONENTS**

- A. Posts: Extruded aluminum, 14 gauge, 0.0641 inch, thick, \_\_\_\_ inch nominal dimensions.

### **2.05 DOOR AND WINDOW COMPONENTS**

- A. Frames: Extruded aluminum, manufacturers standard profile and thickness.
  - 1. Finish: Anodized finish.
  - 2. Color: As indicated on Finish Key.
  - 3. Prepare and reinforce door frames for door hardware; provide resilient silencers color matched to frame color.
  - 4. Frame corners mitered and anchored with concealed clips.

- B. Aluminum and glass doors:
  - 1. Stiles and rails: Extruded aluminum, manufacturers standard profile and thickness.
  - 2. Color: As indicated on Finish Key.
  - 3. Prepare and reinforce doors for door hardware.
  - 4. Bottom rail height: 10 inches.
- C. Doors and Panels: Manufacturer's standard.
- D. Door Hardware: Provide as part of the work of this section. Refer to Section 08 7100 - Door Hardware descriptions.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that building conditions are ready to receive partitions and that field measured dimensions are as required by the partition system manufacturer.
- B. Verify that required utilities are available, in proper location, and ready for use.

#### **3.02 INSTALLATION**

- A. Install partitions after placement of floor finish.
- B. Install in accordance with partition system manufacturer's instructions; erect vertical members plumb, and horizontal members level. Install components in alignment and secured together in accordance with manufacturers instructions.
  - 1. Secure aluminum floor runners not over carpet to the floor as required by the use of power-driven pins or other approved fasteners. Where partitions are installed over carpeting and carpet grippers are used on the floor runner, fasteners shall only be required at door openings.
  - 2. Provide all required fillers between modular partitions and permanent structure.
  - 3. Provide continuous positive seal, to prevent light and sound transmission, where partition system contacts floor, ceiling, wall, and other abutting surfaces.
- C. Doors: Install in accordance with partition system manufacturer's instructions; hang to fit square within frame and to swing freely, without binding.
- D. Door Hardware: Install in accordance with partition system manufacturer's instructions.
- E. Glazing: Install in accordance with partition system manufacturer's instructions.

#### **3.03 ADJUSTING**

- A. Adjust doors and frames to provide smooth door operation from open to closed position without gravity movement of door from any position.

#### **3.04 PROTECTION**

- A. Do not permit subsequent construction activities to cause damage to appearance or operation of installed partition components before Date of Substantial Completion.

### **END OF SECTION**

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## **SECTION 10 2241 - OPERABLE GLASS PARTITIONS**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Operable glass partitions, manually operated.

#### **1.03 REFERENCE STANDARDS**

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials Current Edition.
- B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2020.
- C. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.
- D. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.
- E. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test 2015 (Reaffirmed 2020).
- F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2021.
- G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2021.
- H. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
- I. ASTM C1036 - Standard Specification for Flat Glass 2021.
- J. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.
- K. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).
- L. ASTM E413 - Classification for Rating Sound Insulation 2022.
- M. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation Between Spaces Separated by Operable Partitions 2012 (Reapproved 2020).

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.
  - 1. Require attendance by representatives of installer and other entities directly affecting, or affected by, construction activities of this section.
  - 2. Notify Architect seven days in advance of scheduled meeting date.
- B. Coordinate the installation of operable partition with supporting structure and gypsum board acoustical bulkhead installation/construction to provide a complete acoustical assembly meeting the STC of the specified operable panel partition.

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's descriptive literature for each component in partition assembly.
- C. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, showing loads at points of attachment to the building structure.

- D. Shop Drawings: Indicate opening sizes, conditions at openings, typical and special details, track layout, details of track and required supports, static and dynamic loads, location and details of pass door and frame, location and installation of hardware, adjacent construction and finish trim, and stacking depth.
  - 1. Include details of:
    - a. Requirements for support and bracing of overhead track.
    - b. Installation details.
    - c. Appearance of manufacturer-supplied door hardware and fittings.
- E. Verification Samples: Two samples, minimum size 2 by 3 inches, representing actual material and finish of exposed metal.
- F. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

## **1.06 QUALITY ASSURANCE**

- A. Single Source Responsibility: Obtain operable panel partitions and mounting hardware from one source from a single manufacturer.
- B. Fabricator Qualifications: Minimum three years of experience designing, assembling, and installing partition assemblies similar to those specified in this section.

## **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until installation.

## **1.08 WARRANTY**

- A. Correct defective Work within a two year period after Date of Substantial Completion.
- B. Provide two year manufacturer warranty against excessive degradation of metal finishes. Include provision for replacement of units with excessive fading, chalking, or flaking.

## **PART 2 PRODUCTS**

### **2.01 BASIS OF DESIGN**

- A. Framed Panels, with Tempered Glazing:
  - 1. Basis of Design: Modernfold, a DORMA Group Company; Acousti-Clear Paired Panel Automatic Seal: [www.modernfold.com/#sle](http://www.modernfold.com/#sle).
- B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product by one of the following.
  - 1. Avanti Systems USA, Inc: [www.avantisystemsusa.com/#sle](http://www.avantisystemsusa.com/#sle).
  - 2. DORMA USA, Inc: [www.dorma.com/#sle](http://www.dorma.com/#sle).
  - 3. NanaWall Systems, Inc: [www.nanawall.com/#sle](http://www.nanawall.com/#sle).
- C. Substitutions: See Section 01 1000 - Summery.

### **2.02 OPERABLE GLASS PARTITIONS**

- A. Operable Glass Partitions - Framed: Top hung, factory fabricated assemblies consisting of double-glazed framed glass panels in configuration indicated on drawings.
  - 1. Frame Finish: RAL 9004 powder coating. Satin Finish (30 degree gloss)
  - 2. Tempered Glass Panels:
    - a. Provide double glaze system consisting of the following glass, one pane on each side of system frame:
      - 1) Face A: 5/16 inch glass mechanically fastened and sealed in frame.
      - 2) Face B: 3/8 inch glass mechanically fastened and sealed in frame.
  - 3. Glass: Clear.
  - 4. Panel Thickness: 4 inch.
  - 5. Panel Height and Width: As indicated on drawings.
  - 6. Panel hardware finish to match frame.
  - 7. Lever hardware on Pass door: Satin Chrome; BHMA 626
  - 8. Designed to withstand normal operation without damage, racking, sagging, or deflection.

9. Finished metal surfaces protected with strippable film.
  10. Factory assembled to greatest extent practicable; may be disassembled to accommodate shipping constraints.
  11. Acoustical Performance, tested in accordance with ASTM E90 and classified in accordance with ASTM E413: STC 45
- B. Sound Seals:
1. Vertical Interlocking Sound Seals between panels: Extruded aluminum astragals with interlocking convex/concave resilient quad-lip gaskets.
  2. Horizontal Top and Bottom Seals: Automatic operable seals providing operating clearance. Seals shall operate automatically without tools or cranks and shall extend as panels are positioned.
- C. Final Closure: Horizontally expanding panel edge with removable crank.
- D. Suspension System:
1. Track: Minimum 11 gage (0.12 inch thick) roll formed steel track.
  2. Carriers: One stainless steel trolley with vinyl roller surfaces per panel.
- E. Pass door: Provide a single pass door matching panels for thickness and appearance with ADA-compliant door hardware and non locking lever latch.
1. Threshold: None.

## **2.03 MATERIALS**

- A. Glass: Tempered float glass meeting requirements of ASTM C1036, Type I, Quality Q3, fully tempered in accordance with ASTM C1048, Kind FT, and as follows:
1. Prepare glazing panels for indicated fittings and hardware before tempering.
  2. Provide exposed glazing edges with flat polished/ground glass finish.
  3. Temper glass materials horizontally; visible tong marks or tong mark distortions are not permitted.
- B. Aluminum Components: Complying with ASTM B221 (ASTM B221M), alloy 6063, temper as indicated, with anodized finish complying with AAMA 611, and powder coating complying with AAMA 2603 or AAMA 2604 for select colors.
- C. Sealant: One-part silicone sealant, complying with ASTM C920, clear.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable partitions.
- B. Do not begin installation until supports and adjacent substrates have been properly prepared.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### **3.02 INSTALLATION**

- A. Install in accordance with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.
- B. Fit and align partition assembly and pocket doors level and plumb.

### **3.03 ADJUSTING**

- A. Adjust operable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.
- B. Adjust swing door hardware for smooth operation.

### **3.04 CLEANING**

- A. Clean installed work to like-new condition.

- B. Thoroughly clean surfaces and materials installed as part of this work.

**3.05 CLOSEOUT ACTIVITIES**

- A. Demonstrate operation of partition and identify potential operational problems.

**3.06 PROTECTION**

- A. Protect installed products and materials until Date of Substantial Completion.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

**END OF SECTION**



## **SECTION 10 2800 - TOILET ACCESSORIES**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Division 00 - Procurement and Contracting Requirements, and Division 01 - General Requirements, are hereby made part of this Section.

#### **1.02 SECTION INCLUDES**

- A. Toilet accessories as indicated on the Drawings.
- B. The following toilet accessories shall be furnished by the Owner, installed by the Contractor (OFCI).
  - 1. Large Roll Toilet tissue dispenser.
  - 2. Hand Sanitizer Dispenser
  - 3. Wall Mounted Soap dispenser
  - 4. Wall Mounted Paper Towel Dispenser.
  - 5. Paper Towel Dispenser / Waste receptacle.
  - 6. Grab bars
  - 7. Mop Hook
  - 8. Custodial cleaning chemical dispenser
- C. Hand Dryer
- D. Shelving
- E. Under-lavatory pipe supply covers.

#### **1.03 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service 2022.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.
- G. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's technical data for each toilet accessory item specified including details of construction relative to materials, dimensions, gages, profiles, method of mounting, specified options and finishes.
- C. Setting Drawings: Provide setting drawings where cutouts are required in other work including templates, substrate preparation instructions and directions for preparing cutouts and installing anchorage devices.

## **1.06 QUALITY ASSURANCE**

- A. Single Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Architect.

## **1.07 COORDINATION**

- A. Inserts and Anchorages: Furnish accessory manufacturer's standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.
- B. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
  - 1. Grind welded joints smooth.
  - 2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.
- B. Keys: Provide 6 keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- F. Fasteners, Screws, and Bolts: Hot dip galvanized.

### **2.02 FINISHES**

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.

### **2.03 COMMERCIAL TOILET ACCESSORIES**

- A. Grab Bars
  - 1. Stainless Steel Type: Provide grab bars with minimum 18 gage (0.050 inch) wall thickness and as follows:
  - 2. Grab Bars: Stainless steel, smooth surface.
    - a. Standard Duty Grab Bars:
      - 1) Push/Pull Point Load: 250 pound-force, minimum.
      - 2) Dimensions: 1-1/2 inch outside diameter, minimum 0.05 inch wall thickness, concealed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
      - 3) Length and Configuration: As indicated on drawings.
      - 4) Products:
        - (a) American Specialties, Inc; 3500: [www.americanspecialties.com/#sle](http://www.americanspecialties.com/#sle).
        - (b) Bobrick; B-6806 Series
        - (c) Bradley Corporation; 812 Series
- B. Purse/Utility Shelf
  - 1. Stainless Steel Shelf: Type-304, 18 gauge stainless steel with satin finish and hemmed front edge.
    - a. Products:
      - 1) American Specialties, Inc; 692: [www.americanspecialties.com/#sle](http://www.americanspecialties.com/#sle).
      - 2) Bobrick; B-298
      - 3) Substitutions: Section 01 6000 - Common Product Requirements.

## **2.04 UNDER LAVATORY PIPE AND SUPPLY COVERS**

- A. Under-Lavatory Pipe and Supply Covers:
  - 1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
  - 2. Construction: 1/8 inch flexible PVC.
    - a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
    - b. Comply with ASTM C1822, type indicated.
    - c. Comply with ASME A112.18.9.
    - d. Comply with ICC A117.1.
  - 3. Color: White.
  - 4. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.
  - 5. Products:
    - a. Plumberex Specialty Products, Inc; Plumberex Handy-Shield Maxx: [www.plumberex.com/#sle](http://www.plumberex.com/#sle).
    - b. Plumberex Specialty Products, Inc; Plumberex Trap Gear: [www.plumberex.com/#sle](http://www.plumberex.com/#sle).
    - c. Plumberex Specialty Products, Inc; Plumberex Pro-Extreme: [www.plumberex.com/#sle](http://www.plumberex.com/#sle).
    - d. Truebro, Inc; Lav-Guard 2

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- D. Verify that field measurements are as indicated on drawings.

### **3.02 PREPARATION**

- A. Deliver inserts and rough-in frames to site for timely installation.

### **3.03 INSTALLATION**

- A. Install new and salvaged accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: Refer to Drawings and as required by accessibility regulations, unless otherwise indicated.

### **3.04 PROTECTION**

- A. Protect installed accessories from damage due to subsequent construction operations.

## **END OF SECTION**

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to work of this Section.

#### 1.02 SUMMARY

- A. This Section includes mechanical general administrative and procedural requirements. The following requirements are included in this Section to supplement the requirements specified in Division 01 Specification Sections.

#### 1.03 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.
1. AABC - Associated Air Balance Council; [www.aabc.com](http://www.aabc.com).
  2. AASHTO - American Association of State Highway and Transportation Officials; [www.transportation.org](http://www.transportation.org).
  3. ABMA - American Bearing Manufacturers Association; [www.americanbearings.org](http://www.americanbearings.org).
  4. ABMA - American Boiler Manufacturers Association; [www.abma.com](http://www.abma.com).
  5. AGA - American Gas Association; [www.aga.org](http://www.aga.org).
  6. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); [www.ahrinet.org](http://www.ahrinet.org).
  7. AMCA - Air Movement and Control Association International, Inc.; [www.amca.org](http://www.amca.org).
  8. ANSI - American National Standards Institute; [www.ansi.org](http://www.ansi.org).

9. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; [www.ashrae.org](http://www.ashrae.org).
  10. ASME - ASME International; (American Society of Mechanical Engineers); [www.asme.org](http://www.asme.org).
  11. ASSE - American Society of Sanitary Engineering; [www.asse-plumbing.org](http://www.asse-plumbing.org).
  12. ASTM - ASTM International; [www.astm.org](http://www.astm.org).
  13. AWS - American Welding Society; [www.aws.org](http://www.aws.org).
  14. AWWA - American Water Works Association; [www.awwa.org](http://www.awwa.org).
  15. CDA - Copper Development Association; [www.copper.org](http://www.copper.org).
  16. CGA - Compressed Gas Association; [www.cganet.com](http://www.cganet.com).
  17. CISPI - Cast Iron Soil Pipe Institute; [www.cispi.org](http://www.cispi.org).
  18. CSA - CSA International; (Formerly: IAS - International Approval Services); [www.csa-international.org](http://www.csa-international.org).
  19. CSI - Construction Specifications Institute (The); [www.csiresources.org](http://www.csiresources.org).
  20. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); [www.cti.org](http://www.cti.org).
  21. FM Approvals - FM Approvals LLC; [www.fmglobal.com](http://www.fmglobal.com).
  22. HI - Hydraulic Institute; [www.pumps.org](http://www.pumps.org).
  23. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
  24. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); [www.ieee.org](http://www.ieee.org).
  25. IGSHPA - International Ground Source Heat Pump Association; [www.igshpa.okstate.edu](http://www.igshpa.okstate.edu).
  26. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); [www.intertek.com](http://www.intertek.com).
  27. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; [www.mss-hq.org](http://www.mss-hq.org).
  28. NADCA - National Air Duct Cleaners Association; [www.nadca.com](http://www.nadca.com).
  29. NAIMA - North American Insulation Manufacturers Association; [www.naima.org](http://www.naima.org).
  30. NEBB - National Environmental Balancing Bureau; [www.nebb.org](http://www.nebb.org).
  31. NECA - National Electrical Contractors Association; [www.necanet.org](http://www.necanet.org).
  32. NEMA - National Electrical Manufacturers Association; [www.nema.org](http://www.nema.org).
  33. NETA - InterNational Electrical Testing Association; [www.netaworld.org](http://www.netaworld.org).
  34. NFPA - National Fire Protection Association; [www.nfpa.org](http://www.nfpa.org).
  35. NSF - NSF International; [www.nsf.org](http://www.nsf.org).
  36. NSPE - National Society of Professional Engineers; [www.nspe.org](http://www.nspe.org).
  37. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; [www.smacna.org](http://www.smacna.org).
  38. STI - Steel Tank Institute; [www.steeltank.com](http://www.steeltank.com).
  39. TEMA - Tubular Exchanger Manufacturers Association, Inc.; [www.tema.org](http://www.tema.org).
  40. UL - Underwriters Laboratories Inc.; [www.ul.com](http://www.ul.com).
  41. USGBC - U.S. Green Building Council; [www.usgbc.org](http://www.usgbc.org).
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should 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, obtain copies directly from publication source.

#### **1.04 PERFORMANCE REQUIREMENTS**

- A. Systems Components Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

#### **1.05 QUALITY ASSURANCE**

- A. Scope of Work: Furnish all labor, material, equipment, technical supervision, and incidental services required to complete, test and leave ready for operation the mechanical systems as specified and as indicated on Drawings.

1. Contract Documents are complimentary, and what is required by one shall be as binding as if required by all. In the event of inconsistencies or disagreements within the Construction Documents bids shall be based on the most expensive combination of quality and quantity of the work indicated.
- B. Ordinances and Codes: Perform all Work in accordance with applicable Federal, State and local ordinances and regulations, the Rules and Regulations of ASHRAE, NFPA, SMACNA and UL, unless otherwise indicated.
  1. Notify the Architect/Engineer in writing before submitting a proposal should any changes in Drawings or Specifications be required to conform to the above codes, rules or regulations.
  2. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without notice to A/E, the Contractor shall bear all costs arising from corrective measures.
- C. Source Limitations: Obtain equipment and other components of the same or similar systems through one source from a single manufacturer.
- D. Tests and Inspections: Perform all tests required by state, city, county and/or other agencies having jurisdiction. Provide all materials, equipment, etc., and labor required for tests.
- E. Performance Requirements: Perform all work in a first class and workmanlike manner, in accordance with the latest accepted standards and practices for the trades involved.
- F. Sequence and Schedule: Perform work to avoid interference with the work of other trades. Remove and relocate work which in the opinion of the Owner's Representatives causes interference.
- G. Labeling Requirement for Packaged Equipment: Electrical panels on packaged mechanical equipment shall bear UL label or label of other Nationally Recognized Testing Laboratory (NRTL) (Intertek, CSA, etc.).

#### **1.06 CODES, PERMITS AND FEES**

- A. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for Mechanical Work shall be secured and paid for by the Contractor. All Work shall conform to all applicable codes, rules and regulations.
- B. Rules of local utility companies shall be complied with. Check with each utility company supplying service to the installation and determine all devices including, but not limited to, all valves, meter boxes, and meters which will be required and include the cost of all such items in proposal.
- C. All work shall be executed in accordance with the rules and regulations set forth in local and state codes. Prepare any detailed drawings or diagrams which may be required by the governing authorities. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.
- D. Refer to Division 22 Section "Domestic Water Piping" for purchase and installation of potable water meters.

#### **1.07 DRAWINGS**

- A. The drawings show the location and general arrangement of equipment, piping and related items. They shall be followed as closely as elements of the construction will permit.
- B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly. Provide fittings, valves, and accessories as required to meet actual conditions.
- C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect/Engineer.
- D. The Architectural and Structural Drawings take precedence in all matters pertaining to the building structure, Mechanical Drawings in all matters pertaining to Mechanical Trades and Electrical Drawings in all matters pertaining to Electrical Trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect/Engineer for resolution.

- E. Drawings are not intended to be scaled for rough-in or to serve as shop drawings. Take all field measurements required to complete the Work.

#### **1.08 MATERIAL AND EQUIPMENT MANUFACTURERS**

- A. Equipment: All items of equipment shall be furnished complete with all accessories normally supplied with the catalog items listed and all other accessories necessary for a complete and satisfactory operating system. All equipment and materials shall be new and shall be standard products of manufacturers regularly engaged in the production of plumbing, heating, ventilating and air conditioning equipment and shall be the manufacturer's latest design.
- B. If an approved manufacturer is other than the manufacturer used as the basis for design, the equipment or product provided shall be equal in size, quality, durability, appearance, capacity, and efficiency through all ranges of operation, shall conform with arrangements and space limitations of the equipment shown on the plans and/or specified, shall be compatible with the other components of the system and shall comply with the requirements for Items Requiring Prior Approval specified in this section of the Specifications. All costs to make these items of equipment comply with these requirements including, but not limited to, piping, sheet metal, electrical work, and building alterations shall be included in the original Bid.
- C. All package unit equipment and skid mounted mechanical components that are factory assembled shall meet, in detail, the products named and specified within each section of the Mechanical and Electrical Specifications.
- D. Changes Involving Electrical Work: The design of the mechanical systems is based on the equipment scheduled on the Drawings. Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified with no additional cost to project. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.
  - 1. Where equipment changes are made that involve additional Electrical Work (larger size motor, additional wiring of equipment, etc.) the Mechanical Trades involved shall compensate the Electrical Trades for the cost of the additional Work required.

#### **1.09 INSPECTION OF SITE**

- A. Visit the site, examine and verify the conditions under which the Work must be conducted before submitting Proposal. The submitting of a Proposal implies that the Contractor has visited the site and understands the conditions under which the Work must be conducted. No additional charges will be allowed because of failure to make this examination or to include all materials and labor to complete the Work.
- B. No contract sum adjustments or contract time extensions will be made for Contractor claims arising from conditions which were or could have been observable, ascertainable or reasonably foreseeable from a site visit or inquiry into local conditions affecting the execution of the work.

#### **1.10 ITEMS REQUIRING PRIOR APPROVAL**

- A. Bids shall be based upon manufactured equipment specified. All items that the Contractor proposes to use in the Work that are not specifically named in the Contract Documents must be submitted for review prior to bids. Such items must be submitted in compliance with Division 01 specifications. Requests for prior approval must be accompanied by complete catalog information, including but not limited to, model, size, accessories, complete electrical information and performance data in the form given in the equipment schedule on the drawings at stated design conditions. Where items are referred to by symbolic designations on the drawings, all requests for prior approval shall bear the same designations.
  - 1. Equipment to be considered for prior approval shall be equal in quality, durability, appearance, capacity and efficiency through all ranges of operation, shall fulfill the requirements of equipment arrangement and space limitations of the equipment shown on the plans and/or specified and shall be compatible with the other components of the system.



2. All costs incurred to make equipment comply with other requirements, including providing maintenance, clearance, piping, sheet metal, electrical, replacement of other components, and building alterations shall be included in the original bid.
- B. Voluntary alternates may be submitted for consideration, with listed addition or deduction to the bid, but will not affect the awarding of the contract.

#### **1.11 ACTION SUBMITTALS**

- A. Submit for review in compliance with Division 01.
- B. Equipment and material submittals required are indicated in the Mechanical; Fire Suppression; Plumbing; and Heating, Ventilating and Air Conditioning Sections. Refer to Division 01 for submittal quantities.
- C. Submittals shall be in groupings of similar or related items. Plumbing fixture submittals shall be in one package including all fixtures intended to be used for this project. Incomplete submittal groupings will be returned "Rejected". Submit product data with identification mark number or symbol numbers as specified or scheduled on the Mechanical Drawings.
- D. Submittals shall be project specific. Standard detail drawings and schedule not clearly indicating which data is associated with this Project will be returned "Rejected".
- E. If deviations (not substitutions) from Contract Documents are deemed necessary by the Contractor, details of such deviations, including changes in related portions of the project and the reasons therefore, shall be included with the submittal for approval.

#### **1.12 INFORMATIONAL SUBMITTALS**

- A. Shop Drawings:
  1. Prepare shop drawings to scale for the Architect/Engineer for review.
  2. Shop drawings shall be reviewed by the Mechanical Contractor for completeness and accuracy prior to submitting to the Architect/Engineer for review. The shop drawings shall be dated and signed by the Mechanical Contractor prior to submission.
  3. No equipment shall be shipped from stock or fabricated until shop drawings for them have been reviewed by the Architect/Engineer. Review is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Any action indicated is subject to the requirement of the plans and specifications.
    - a. By the review of shop drawings, the Architect/Engineer does not assume responsibility for actual dimensions or for the fit of completed work in position, nor does such review relieve Mechanical Trades of full responsibility for the proper and correct execution of the work required.
    - b. Contractor is responsible for:
      - 1) Dimensions, which shall be confirmed and correlated at the job site.
      - 2) Fabrication processes and techniques of construction.
      - 3) Quantities.
      - 4) Coordination of Contractor's work with all other trades.
      - 5) Satisfactory performance of Contractor's work.
      - 6) Temporary aspects of the construction process.
  4. Submit detailed shop drawings of piping systems showing pipe routing and types and locations of all pipe hangers.
- B. Coordination Drawings:
  1. Submit project specified coordination drawings for review in compliance with Division 01 Specification Sections.

#### **1.13 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Instructional Manuals:
  1. Submit project specific Operation and Maintenance Instructional Manuals for review in compliance with Division 01 Specification Sections.
  2. Provide complete operation and maintenance instructional manuals covering all mechanical equipment herein specified, together with parts lists. Maintenance and

operating instructional manuals shall be job specific to this project. Generic manuals are not acceptable. One copy of all manuals shall be furnished for Owner. Maintenance and operating instructional manuals shall be provided when construction is approximately 75 percent complete.

3. For Commissioned Projects: Operation and maintenance instructional manuals shall be submitted a minimum of four weeks prior to functional testing.
  4. Format: Submit operation and maintenance manuals in the following format:
    - a. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
      - 1) Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
      - 2) Enable inserted reviewer comments on draft submittals.
  5. The operating and maintenance instructions shall include a brief, general description for all mechanical systems including, but not limited to:
    - a. Routine maintenance procedures.
    - b. Lubrication chart listing all types of lubricants to be used for each piece of equipment and the recommended frequency of lubrication.
    - c. Trouble-shooting procedures.
    - d. Contractor's telephone numbers for warranty repair service.
    - e. Submittals.
    - f. Recommended spare parts list.
    - g. Names and telephone numbers of major material suppliers and subcontractors.
    - h. System schematic drawings.
- B. Record Drawings:
1. Submit record drawings in compliance with Division 01.
  2. Contractor shall submit to the Architect/Engineer, record drawings on electronic media or vellum which have been neatly marked to represent as-built conditions for all new mechanical work.
  3. The Contractor shall keep accurate note of all deviations from the construction documents and discrepancies in the underground concealed conditions and other items of construction on field drawings as they occur. The marked up field documents shall be available for review by the Architect, Engineer and Owner at their request.
- C. Warranties:
1. Warranty: Comply with the requirements in Division 01 Specification Sections. Contractor shall warranty that the mechanical installation is free from defects and agrees to replace or repair, to the Owner's satisfaction, any part of this mechanical installation which becomes defective within a period of one year (unless specified otherwise in other Mechanical; Fire Suppression; Plumbing; or Heating, Ventilating and Air Conditioning Sections) from the date of substantial completion following final acceptance, provided that such failure is due to defects in the equipment, material, workmanship or failure to follow the contract documents.
  2. File with the Owner any and all warranties from the equipment manufacturers including the operating conditions and performance capacities they are based on.

#### **1.14 INSTRUCTION OF OWNER PERSONNEL**

- A. Before final inspection, instruct Owner's designated personnel in operation, adjustment, and maintenance of mechanical equipment and systems at agreed upon times. A minimum of 24 hours of formal instruction to Owner's personnel shall be provided for each building. Additional hours are specified in individual specification sections.
- B. For equipment requiring seasonal operation, perform instructions for other seasons within six months.
- C. Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- D. In addition to individual equipment training provide overview of each mechanical system. Utilize the as-built documents for this overview.

- E. Prepare and insert additional data in operation and maintenance manual when need for such data becomes apparent during instruction.

#### **1.15 WARRANTY**

- A. Warranty: Comply with the requirements in Division 01 Specification Sections. Contractor shall warranty that the mechanical installation is free from defects and agrees to replace or repair, to the Owner's satisfaction, any part of this mechanical installation which becomes defective within a period of one year (unless specified otherwise in other Mechanical; Fire Suppression; Plumbing; or Heating, Ventilating and Air Conditioning Sections) from the date of substantial completion following final acceptance, provided that such failure is due to defects in the equipment, material, workmanship or failure to follow the contract documents.
- B. File with the Owner any and all warranties from the equipment manufacturers including the operating conditions and performance capacities they are based on.

### **PART 2 - PRODUCTS (NOT APPLICABLE)**

### **PART 3 - EXECUTION**

#### **3.01 MECHANICAL DEMOLITION WORK**

- A. Demolition of existing mechanical equipment and materials shall be done by the Contractor unless otherwise indicated. Include items such as, but not limited to, existing piping, pumps, ductwork, supports, and equipment where such items are not required for the proper operation of the modified system.
- B. Include draining of piping systems where required for demolition, modification of, or connection to existing systems.
- C. In general, demolition work is indicated on the Drawings. However, the Contractor shall visit the job site to determine the full extent and character of this Work.
- D. Unless specifically noted to the contrary, removed materials shall not be reused in the work. Salvaged materials that are to be reused shall be stored safe against damage and turned over to the appropriate trade for reuse.
  - 1. Salvaged materials of value that are not to be reused shall remain the property of the Owner unless such ownership is waived.
  - 2. Remove items from the systems and turn over to the Owner in their condition prior to removal. The Owner will move and store these materials.
  - 3. Items on which the Owner waives ownership shall become the property of the Contractor, who shall remove and legally dispose of same, away from the premises.
- E. Work that has been cut or partially removed shall be protected against damage until covered by permanent construction.
- F. Clean and flush the interior and exterior of existing relocated equipment and its related piping, valves, and accessories that are to be reused of mud, debris, pipe dope, oils, welding slag, loose mill scale, rust, and other extraneous material so that the existing equipment and accessories can be repainted and repaired as required for the proper operation and performance of the relocated equipment.
- G. Where existing equipment is to be removed, cap piping under floor, behind face of wall, above ceiling, or at mains.
- H. Cap ductwork and cap piping immediately adjacent to demolition as soon as demolition commences in order to allow existing systems to remain in operation.
  - 1. Cap or plug piping with same or compatible piping material.
  - 2. Cap or plug ducts with same or compatible ductwork material.

#### **3.02 REFRIGERANT HANDLING**

- A. Refrigerant Installation and Disposal: Perform all work related to refrigerant contained in chillers, cooling coils, air conditioners, and similar equipment, including related piping, in strict accordance with the following requirements:
  - 1. ASHRAE Standard 15 and Related Revisions: Safety Code for Mechanical Refrigeration.

2. ASHRAE Standard 34 and Related Revisions: Number Designation and Safety Classification of Refrigerants.
  3. United States Environmental Protection Agency (US EPA) requirements of Section 8 08 (Prohibition of Venting and Regulation of CFC) and applicable State and Local regulations of authorities having jurisdiction.
- B. Recovered refrigerant is the property of the Contractor. Dispose of refrigerant legally, in accordance with applicable rules and regulations.

### **3.03 WORK IN EXISTING BUILDINGS**

- A. The Owner will provide access to existing buildings as required. Access requirements to occupied buildings shall be identified on the project schedule. The Contractor, once Work is started in the existing building, shall complete same without interruption so as to return work areas as soon as possible to Owner.
- B. Adequately protect and preserve all existing and newly installed Work. Promptly repair any damage to same at Contractor's expense.
- C. Consult with the Owner's Representative as to the methods of carrying on the Work so as not to interfere with the Owner's operation any more than absolutely necessary. Accordingly, all service lines shall be kept in operation as long as possible and the services shall only be interrupted at such time as will be designated by the Owner's Representative.
- D. Prior to starting work in any area, obtain approval for doing so from a qualified representative of the Owner who is designated and authorized by the Owner to perform testing and abatement, if necessary, of all hazardous materials including but not limited to, asbestos. The Contractor shall not perform any inspection, testing, containment, removal or other work that is related in any way whatsoever to hazardous materials under the Contract.

### **3.04 TEMPORARY SERVICES**

- A. Provide temporary service as described in Division 01.
- B. The existing building will be occupied during construction. Maintain mechanical services and provide necessary temporary connections and their removal at no additional cost to the Owner.

### **3.05 WORK INVOLVING OTHER TRADES**

- A. Certain items of equipment or materials specified in the Mechanical Division may have to be installed by other trades due to code requirements or union jurisdictional requirements. In such instances, the Contractor shall complete the work through an approved, qualified subcontractor and shall include the full cost for same in proposal.

### **3.06 ACCEPTANCE PROCEDURE**

- A. Upon successful completion of start-up and recalibration, but prior to building acceptance, substantial completion and commencement of warranties, the Architect/Engineer shall be requested in writing to observe the satisfactory operation of all mechanical control systems.
- B. The Contractor shall demonstrate operation of equipment and control systems, including each individual component, to the Owner and Architect/Engineer.
- C. After correcting all items appearing on the punch list, make a second written request to the Owner and Architect/Engineer for observation and approval.
- D. After all items on the punch list are corrected and formal approval of the mechanical systems is provided by the Architect/Engineer, the Contractor shall indicate to the Owner in writing the commencement of the warranty period.
- E. Operation of the following systems shall be demonstrated:
1. Air Handling Systems.
  2. Refrigeration Systems.
  3. Chilled Water Systems.
  4. Condenser Water Systems.
  5. Process Cooling Systems.
  6. Heating Systems.
  7. Steam Pressure Reducing Stations.

8. Condensate Receivers.
  9. Domestic Water Booster Systems.
  10. Domestic Hot Water Heaters.
  11. Domestic Hot Water Mixing Stations.
  12. Compressed Air Systems.
  13. Vacuum Systems.
  14. Purified Water Systems.
  15. Chemical Treatment Systems.
  16. Energy Recovery Systems.
  17. Temperature Controls.
  18. Building Automation System.
  19. Lab Airflow Controls.
  20. Exhaust Systems.
  21. Smoke Purge Systems.
- F. For systems requiring seasonal operation, demonstrate system performance within six months when weather conditions are suitable.

**3.07 PROJECT COMMISSIONING**

- A. Refer to Division 01 "Project Commissioning" and the Commissioning Manual.
- B. Purpose: Training, documentation and verification of the operation and functional performance of mechanical systems for compliance with the "design intent."

**END OF SECTION 20 0500**

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## SECTION 20 0510 - BASIC MECHANICAL MATERIALS AND METHODS

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  1. Division 20 Section "Mechanical General Requirements."
  2. Division 22 Section "Domestic Water Piping" for flushing and cleaning of potable water piping.

3. Division 23 Section "Piping Systems Flushing and Chemical Cleaning" for flushing and cleaning of HVAC piping.

#### **1.02 SUMMARY**

- A. This section includes mechanical materials and installation methods common to mechanical piping systems, sheet metal systems and equipment. This section supplements all other Division 20, 21, 22, and 23 Mechanical Sections, and Division 01 Specification Sections.

#### **1.03 DEFINITIONS**

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
  1. ABS: Acrylonitrile-butadiene-styrene plastic.
  2. CPVC: Chlorinated polyvinyl chloride plastic.
  3. PE: Polyethylene plastic.
  4. PVC: Polyvinyl chloride plastic.
  5. RTRF: Reinforced thermosetting resin (fiberglass) fittings.
  6. RTRP: Reinforced thermosetting resin (fiberglass) pipe.
- G. The following are industry abbreviations for rubber materials:
  1. EPDM: Ethylene-propylene-diene terpolymer rubber.
  2. NBR: Acrylonitrile-butadiene rubber.

#### **1.04 ACTION SUBMITTALS**

- A. Product Data: For the following:
  1. Transition fittings.
  2. Dielectric fittings.
  3. Mechanical sleeve seals.
  4. Escutcheons.

#### **1.05 INFORMATIONAL SUBMITTALS**

- A. Welding certificates.
- B. Brazing Certificates: As required by ASME Boiler and Pressure Vessel Code, Section IX, or AWS B2.2.

#### **1.06 QUALITY ASSURANCE**

- A. Regulatory Requirements: Comply with requirements in Public Law 111-380, "Reduction of Lead in Drinking Water Act," about lead content in materials that will be in contact with potable water for human consumption.
- B. Comply with NSF 14, "Plastics Piping System Components and Related Materials," for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.
- C. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.
- D. Comply with NSF 372, "Drinking Water System Components – Lead Content" for potable domestic water piping and components.



- E. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
  - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
  - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- F. Duct Joint and Seam Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D9.1, "Sheet Metal Welding Code."
- G. Structural Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1, "Structural Welding Code--Steel."
  - 2. AWS D1.2, "Structural Welding Code--Aluminum."
  - 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
  - 4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
  - 5. AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- H. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications," or AWS B2.2, "Standard for Brazing Procedure and Performance Qualification."
- I. Soldering: Qualify processes and operators according to AWS B2.3/2.3M, "Specification for Soldering Procedure and Performance Qualification."
- J. Installer Qualifications:
  - 1. Installers of Grooved Components: Installers shall be certified by the grooved component manufacturer as having been trained and qualified to join piping with grooved couplings, fittings, and specialties.
  - 2. Installers of Pressure-Sealed Joints: Installers shall be certified by the pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.
  - 3. Fiberglass Pipe and Fitting Installers: Installers of RTRF and RTRP shall be certified by the manufacturer of pipes and fittings as having been trained and qualified to join fiberglass piping with manufacturer-recommended adhesive.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Storage and Protection: Provide adequate weather protected storage space for all mechanical equipment and materials deliveries to the job site. Storage locations will be designated by the Owner's Representative. Equipment stored in unprotected areas must be provided with temporary protection.
  - 1. Protect equipment and materials from theft, injury or damage.
  - 2. Protect equipment outlets, pipe and duct openings with temporary plugs or caps.
  - 3. Materials with enamel or glaze surface shall be protected from damage by covering and/or coating as recommended in bulletin "Handling and Care of Enameled Cast Iron Plumbing Fixtures", issued by the Plumbing Fixtures Manufacturer Association, and as approved.
  - 4. Electrical equipment furnished by Mechanical Trades and installed by the Electrical Trades: Turn over to Electrical Trades in good condition, receive written confirmation of same.
  - 5. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
  - 6. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

#### **1.08 COORDINATION**

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations. Coordinate with other trades to ensure accurate locations and sizes of mechanical spaces, chases, slots, shafts, recesses and openings.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Install Work to avoid interference with work of other trades including, but not limited to, Architectural and Electrical Trades. Remove and relocate any work that causes an interference at Contractor's expense.

- D. Coordinate requirements for and provide access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."
- E. The mechanical trades shall be responsible for all damage to other work caused by their work or through the neglect of their workers.
  - 1. All patching and repair of any such damaged work shall be performed by the trades which installed the work. The cost shall be paid by the Mechanical Trades.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### **2.02 PIPE, TUBE, AND FITTINGS**

- A. Refer to individual Division 21, 22, and 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

### **2.03 JOINING MATERIALS**

- A. Refer to individual Division 21, 22, and 23 piping Sections for special joining materials not listed below.
- B. Unions: Pipe Size 2 Inches and Smaller:
  - 1. Ferrous pipe: Malleable iron ground joint type unions.
  - 2. Unions in galvanized piping system shall be galvanized.
  - 3. Copper tube and pipe: Bronze unions with soldered joints.
- C. Flanges: Pipe Sizes 2-1/2 Inch and Larger:
  - 1. Ferrous pipe: Standard weight, forged steel weld neck flanges.
  - 2. Copper tube and pipe: Slip-on bronze flanges.
- D. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- E. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated. Square head bolts and nuts are not acceptable.
- F. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- G. Solder Filler Metals: ASTM B 32, lead-free, antimony-free, silver-bearing alloys. Include water-flushable flux according to ASTM B 813.
- H. Brazing Filler Metals: Alloys meeting AWS A5.8.
  - 1. Use Type BcuP Series, silver-bearing, copper-phosphorus alloys for joining copper or bronze socket fittings with copper pipe. Flux is prohibited unless used with bronze fittings.
  - 2. Use Type Bag Series, cadmium-free silver alloys for joining copper with steel, stainless steel, or other ferrous alloys.
- I. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- J. Welding Materials: Comply with Section II, Part C, of ASME Boiler and Pressure Vessel Code for welding materials appropriate for wall thickness and for chemical analysis of pipe being welded.
- K. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F 493.

- L. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
- M. Solvent Cements for Joining ABS Piping: ASTM D 2235.
- N. Solvent Cements for Joining PVC to ABS Piping Transition: ASTM D 3138.
- O. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

#### **2.04 PIPE THREAD COMPOUNDS**

- A. General: Pipe thread compounds for the fluid service compatible with piping materials provided.
- B. Potable Water Service and Similar Applications: Compounds acceptable to U.S. Department of Agriculture (USDA) or Food and Drug Administration (FDA). Compounds containing lead are prohibited.
- C. Galvanized Steel: Inorganic zinc-rich coatings or corrosion inhibited proprietary compounds to coat raw carbon steel surfaces, in lieu of subsequent painting. Compounds containing lead are prohibited.
  - 1. Manufacturers:
    - a. Carboline "Carbo-Zinc 12."
    - b. Tnemec.
    - c. Koppers.
- D. Steam and Steam Condensate: Graphite and oil or proprietary corrosion inhibited compounds suitable for system temperatures.
  - 1. Manufacturers:
    - a. Cameron; A Schlumberger Company; Key "Graphite Paste."
    - b. Other approved.
- E. Natural Gas System: Use either of the following:
  - 1. Tetrafluoroethylene (Teflon) tape 2 to 3 mils thick for threaded joints.
    - a. Manufacturers:
      - 1) Cadillac Plastic.
      - 2) Permacel.
      - 3) Other approved.
  - 2. Lead-free pipe thread compounds suitable for service.
    - a. Manufacturers:
      - 1) HCC Holdings, Inc.; Hercules Pro Dope.
      - 2) Mill-Rose Company (The); Clean-Fit Products; Blue Monster Thread Sealant.
      - 3) Oatey; Great Blue Pipe Joint Compound.
      - 4) RectorSeal LLC: A CSW Industrials Company; No. 5, No.5 Special, and No. 5 Sub-Zero Pipe Thread Sealants.

#### **2.05 TRANSITION FITTINGS**

- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
  - 1. Manufacturers:
    - a. Cascade Waterworks Mfg. Co.
    - b. Dresser Industries, Inc.; DMD Div.
    - c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
    - d. JCM Industries.
    - e. Smith-Blair, Inc.
    - f. Viking Johnson.
  - 2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
  - 3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
  - 4. Aboveground Pressure Piping: Pipe fitting.
- B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
  - 1. Manufacturers:
    - a. IPEX Inc. (formerly Eslon Thermoplastics).

- C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
  - 1. Manufacturers:
    - a. Thompson Plastics, Inc.
- D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.
  - 1. Manufacturers:
    - a. NIBCO INC.
    - b. NIBCO, Inc.; Chemtrol Div.
- E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.
  - 1. Manufacturers:
    - a. Cascade Waterworks Mfg. Co.
    - b. Fernco, Inc.
    - c. Mission Rubber Company.
    - d. Plastic Oddities, Inc.
    - e. Can-Tex Industries Division of Harsco Corp. "CT-Adaptors".
    - f. Joint Inc., "Caulder".

## **2.06 DIELECTRIC FITTINGS**

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Brass Unions, Brass Nipples, Brass Couplings: For systems up to 286 deg F.
- D. Dielectric-Flange Kits: Include full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
  - 1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Capitol Manufacturing Co.
    - d. GF Piping Systems; George Fischer Central Plastics.
    - e. Epco Sales, Inc.
    - f. Pipeline Seal and Insulator, Inc.
    - g. Watts Water Technologies, Inc.; Watts Regulator Co.
    - h. Zurn Industries, Inc.; Wilkins Div.
  - 2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- E. Dielectric Nipple/Waterway Fittings: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, male NPT threaded, or grooved ends; and 300-psig minimum working pressure at 230 deg F.
  - 1. Manufacturers:
    - a. ASC Engineered Solutions; Gruvlok Manufacturing; DI-LOK Nipples.
    - b. Elster Group; Perfection Corp.; ClearFlow.
    - c. Precision Plumbing Products, Inc.; ClearFlow.
    - d. Sioux Chief Manufacturing Co., Inc.
    - e. Tyco Fire & Building Products; Grinnell Mechanical Products; Figure 407 ClearFlow.
    - f. Victaulic Co. of America; Style 47 ClearFlow.

## **2.07 SLEEVES**

- A. Steel Pipe: ASTM A53, Type E, Grade B, Schedule 40, and 0.375 inch wall black.
- B. Steel Pipe: ASTM A53, Type E, Grade B, Schedule 40, and 0.375 inch wall galvanized, plain ends.
- C. Water Stop: Cast or ductile-iron; fabricated steel; PVC; or rotationally molded HDPE pipe; with plain ends and integral water stop, unless otherwise indicated.

1. Manufacturers:
  - a. Advance Products & Systems, Inc.; Infinity and Gal-Vo-Plast Sleeves.
  - b. Calpico, Inc.
  - c. Metraflex Co.
  - d. Pipeline Seal and Insulator, Inc.
- 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.

## **2.08 ESCUTCHEONS**

- A. Description: Manufactured wall and ceiling escutcheons, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
  1. New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping or Piping in High Humidity Areas: One-piece, cast-brass type with polished chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    - d. Bare Piping in Finished Spaces: One-piece, stamped-steel type.
    - e. Bare Piping in Unfinished Service Spaces or Equipment Rooms: Split-plate, stamped-steel type with concealed hinge and set screw.
  2. Existing Piping: Use the following:
    - a. Chrome-Plated Piping or Piping in High Humidity Areas: Split-casting, cast-brass type with chrome-plated finish.
    - b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
    - c. Bare Piping: Split-plate, stamped-steel type with set screw or spring clips.

## **2.09 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.

## **2.10 EPOXY BONDING COMPOUND**

- A. Two-component system suitable for bonding wet or dry concrete to each other and to other materials.
- B. Manufacturers:
  1. Euco 452 #450; Euclid Chemical Co.
  2. Epobond; L & M Construction Chemicals.
  3. Sikadur 87; Sika Corp.

## **2.11 LEAK DETECTOR SOLUTION**

- A. Commercial leak detector solution for pipe system testing.
- B. Manufacturers:
  1. American Gas and Chemicals Inc.; Leak Tec.
  2. Cole-Parmer Inst. Co.; Leak Detector.
  3. Guy Speaker Co. Inc.; Squirt 'n Bubbles.

## **2.12 PIPING CONCEALMENT SYSTEM**

- A. Manufacturers:
  1. ARSCO Manufacturing Company.
  2. DecoShield Systems, Inc.
  3. JG Innovations Inc.
- B. Description: Modular system of support brackets and covers made to protect piping.

- C. Brackets: Glass-reinforced nylon.
- D. Covers: Steel sections of length, shape, and size required for size and routing of piping.

### **PART 3 - EXECUTION**

#### **3.01 PIPING SYSTEMS - COMMON REQUIREMENTS**

- A. Refer to piping application schedules on the Drawings.
- B. Install piping according to the following requirements and Division 21, 22, and 23 Sections specifying piping systems, and in accordance with manufacturer's instructions.
- C. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. The Drawings shall be followed as closely as elements of construction will permit.
- D. During the progress of construction, protect open ends of pipe, fittings, and valves to prevent the admission of foreign matter. Place plugs or flanges in the ends of all installed work whenever work stops. Plugs shall be commercially manufactured products.
- E. Prior to and during laying of pipe, maintain excavations dry and clear of water and extraneous materials. Provide minimum 4 inches of clearance in all directions for pipe passing under or through building grade beams.
- F. Weld-o-lets and thread-o-lets can be used for annular flow measuring devices, temperature control components, and thermal wells in steel pipe. Pipe taps shall be drilled and deburred. Torch cutting is not acceptable.
- G. Brazolets can be used for annular flow measuring devices, temperature control components, and thermal wells in copper tube. Pipe taps shall be drilled and deburred. Torch cutting is not acceptable.
- H. Clean and lubricate elastomer joints prior to assembly.
- I. Clean damaged galvanized surfaces and touch-up with a zinc rich coating.
- J. Install piping to conserve building space and not interfere with use of space.
- K. Group piping whenever practical at common elevations.
- L. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
  - 1. Install piping to allow for expansion and contraction at locations where piping crosses building or structure expansion joints.
- M. Slope piping and arrange systems to drain at low points.
- N. Slope horizontal piping containing non-condensable gases 1 inch per 100 feet, upward in the direction of the flow.
- O. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- P. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- Q. In concealed locations where piping, other than black steel, cast-iron, or galvanized steel, is installed through holes or notches in studs, joists, rafters or similar members less than 1-1/2 inches from the nearest edge of the member, the pipe shall be protected by shield plates. Protective shield plates shall be a minimum of 1/16 inch thick steel, shall cover the area of the pipe where the member is notched or bored, and shall extend a minimum of 2 inches above sole plates and below top plates.
- R. Do not penetrate building structural members unless specifically indicated on drawings.
- S. Install piping above accessible ceilings to allow sufficient space for ceiling panel and light fixture removal.
- T. Install valves with stems upright or horizontal, not inverted.
- U. Provide clearance for installation of insulation and access to valves and fittings.
- V. Install piping to permit valve and equipment servicing. Do not install piping below valves and/or terminal equipment. Do not install piping above electrical equipment.

- W. Install piping at indicated slopes. Provide drain valves with hose end connections and caps at all piping low points, where piping is trapped and at all equipment.
- X. Install piping free of sags and bends.
- Y. Install fittings for changes in direction and branch connections.
- Z. Unless otherwise indicated or specified, install branch connections to mains using tee fittings in main pipe:
  - 1. Branch connected to bottom of main pipe for HVAC systems. Side connection is acceptable. Connection above centerline of main is unacceptable. For up-feed risers, connect branch to top of main pipe.
  - 2. Branch connected to top of main for steam and condensate, plumbing systems, compressible gasses, and vacuum.
- AA. Install piping to allow application of insulation.
- BB. Select system components with pressure rating equal to or greater than system operating pressure.
- CC. After completion, fill, clean, and treat systems. Refer to Division 23 Sections "Hydronic Piping," "Piping Systems Flushing and Chemical Cleaning," and "HVAC Water Treatment."
- DD. Install escutcheons for penetrations of walls below ceiling, and ceilings.
- EE. Sleeves are not required for core-drilled holes in poured concrete walls.
- FF. Permanent sleeves are not required for holes formed by removable PE sleeves in poured concrete walls.
- GG. Install sleeves for pipes passing through footings and foundation walls, masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces of walls.
    - a. Exception: Extend sleeves installed in floors 2 inches above finished floor level.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Schedule 40 Black Steel Sleeves: For pipes smaller than NPS 12 penetrating interior walls.
    - b. 0.375 Inch Wall Black Steel Sleeves: For pipes NPS 12 and larger penetrating interior walls.
    - c. Schedule 40 Galvanized Steel Sleeves: For pipes smaller than NPS 12 penetrating floors, and roof slabs.
    - d. 0.375 Inch Wall Galvanized Steel Sleeves: For pipes NPS 12 and larger penetrating floors and roof slabs.
    - e. For pipes penetrating floors with membrane water proofing provide cast iron sleeve with clamping flanges. Secure/seal membrane to sleeves with clamping flanges.
  - 4. Seal sleeves in concrete floors roof slabs and masonry walls with grout.
  - 5. Seal sleeves in plaster/gypsum-board partitions with plaster or dry wall compound and caulk with non-hardening silicone sealant to provide airtight installation.
  - 6. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- HH. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and modular mechanical seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing modular mechanical seals.
  - 1. Install Schedule 40 galvanized steel pipe for sleeves smaller than 12 inches in diameter.
  - 2. Install 0.375 galvanized steel pipe for sleeves 12 inches and larger in diameter.
  - 3. Modular Mechanical Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble modular mechanical seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- II. New, Poured Concrete, Underground, Exterior-Wall and Slab on Grade Pipe Penetrations: Install water stop sleeves prior to pour. Seal pipe penetrations using modular mechanical seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing modular mechanical seals.

1. Modular Mechanical Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble modular mechanical seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- JJ. Existing Underground, Exterior-Wall and Slab on Grade Pipe Penetrations: Seal core drilled pipe penetrations using modular mechanical seals. Allow for 1-inch annular clear space between pipe and cored opening for installing modular mechanical seals.
  1. Modular Mechanical Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of cored hole. Assemble modular mechanical seals and install in annular space between pipe and cored opening. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- KK. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.
  1. Seal openings around pipes in sleeves through walls, floors and ceilings, and where floors, fire rated walls and smoke barriers are penetrated. Firestop materials shall be UL listed and shall have a fire rating equal to or greater than the penetrated barrier.
  2. Refer to Division 07 Specification Sections for materials and UL Classified firestop systems.
- LL. Pipe Roof Penetration Enclosures:
  1. Coordinate delivery of roof penetration enclosures to jobsite.
  2. Locate and set curbs on roof.
  3. Framing, flashing, and attachment to roof structure are specified under Division 07.
  4. Attach cap to curbs, cut pipe boots to fit pipe, and clamp boots to pipe or conduit.
- MM. Verify final equipment locations for roughing-in.
- NN. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### **3.02 PIPING JOINT CONSTRUCTION**

- A. Join pipe and fittings according to the following requirements and Division 21, 22, and 23 Sections specifying piping systems.
- B. Cut piping square.
- C. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- D. Remove scale, slag, dirt, oil, and debris from inside and outside of pipe and fittings before assembly.
- E. Clean damaged galvanized surfaces and touch-up with a zinc rich coating.
- F. Use standard long sweep pipe fittings for changes in direction. No mitered joints or field fabricated pipe bends will be permitted. Short radius elbows may be used where specified or specifically authorized by the Architect.
- G. Make tee connections with screwed tee fittings, soldered fittings or specified welded connections. Make welded branch connections with either welding tees or forged branch outlet fittings in accordance with ASTM A234, ANSI B16.9 and ANSI B16.11. For forged branch outlets, furnish forged fittings flared for improved flow where attached to the run, reinforced against external strains and to full pipe-bursting strength requirements. "Fishmouth" connections are not acceptable.
- H. Use eccentric reducers for drainage and venting of pipe lines; bushings are not permitted.
- I. Provide pipe openings using fittings for all systems control devices, thermometers, gauges, etc. Drilling and tapping of pipe wall for connections is prohibited.
- J. Provide temperature sensing device thermal wells and similar piping specialty connections.
- K. Provide instrument connections except thermal wells with specified isolating valves at point of connection to system.
- L. Locate instrument connections in accordance with manufacturer's instructions for accurate read-out of function sensed. Locate instrument connections for easy reading and service of devices.
- M. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."



- N. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
- O. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- P. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
  - 1. Weld-o-lets and thread-o-lets can be used for annular flow measuring devices, temperature control components, and thermal wells. Pipe taps shall be drilled and deburred. Torch cutting is not acceptable.
- Q. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on gaskets and bolt threads.
  - 1. Assemble flanged joints with fresh-stock gasket and hex head nuts, bolts or studs. Make clearance between flange faces such that the connections can be gasketed and bolted tight without strain on the piping system. Align flange faces parallel and bores concentric; center gaskets on the flange faces without projection into the bore.
  - 2. Lubricate bolts before assembly to insure uniform bolt stressing. Draw up and tighten bolts in staggered sequence to prevent unequal gasket compression and deformation of the flanges. Do not mate a flange with a raised face to a companion flange with a flat face; machine the raised face down to a smooth matching surface and use a full face gasket. After the piping system has been tested and is in service at its maximum temperature, check bolting torque to provide required gasket stress.
- R. Grooved Joints: Assemble joints with grooved-end-pipe or grooved-end-tube coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Galvanized piping shall be cut grooved to prevent damage to galvanizing on internal pipe surfaces. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved joint products. The manufacturer's representative shall periodically visit the jobsite and review installation. Contractor shall remove and replace any joints deemed improperly installed.
- S. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.
- T. Pressure-Sealed Joints: Use manufacturer-recommended tool and procedure. Leave insertion marks on pipe after assembly.
- U. Dissimilar-Metal Piping Joints: Construct joints using dielectric fittings compatible with both piping materials. Refer to Application Schedules on the Drawings.
- V. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
  - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
  - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
  - 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
  - 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- W. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- X. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

- Y. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
  - 1. Plain-End Pipe and Fittings: Use butt fusion.
  - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.
- Z. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.
- AA. Remake joints which fail pressure tests with new materials including pipe, fittings, gaskets and/or a filler.

### **3.03 ACCESS DOORS**

- A. Provide access doors for installation by architectural trades. Provide access doors in the walls, as required to make all valves, controls, coils, motors, air vents, filters, electrical boxes and other equipment installed by the Contractor accessible. Minimum size 12 inches x 12 inches. Provide access doors in the ceiling, for accessibility as mentioned above, 24 inches x 24 inches minimum size. Areas with accessible ceilings (ceilings where lay-in panels are not fastened in place and can be individually removed without removal of adjacent tiles) will not require access doors. Refer to Division 08 Section "Access Doors and Frames" for manufacturers and model numbers and additional information.
- B. When access doors are in fire resistant walls or ceilings, they shall bear the Underwriters' Laboratories, Inc., Label, with time design rating equal to or greater than the wall or ceiling unless they were a part of the tested assembly.

### **3.04 EQUIPMENT CONNECTIONS**

- A. Make connections to equipment, fixtures, and other items included in the work in accordance with the submittals and rough-in measurements furnished by the manufacturers of the particular equipment furnished.
  - 1. Any and all additional connections not shown on the drawings but shown on the equipment manufacturer's submittal or required for the successful operation of the equipment shall be installed as part of this Contract at no additional charge to the Owner.
- B. All piping connections to pumps, coils, and other equipment shall be installed without strain at the pipe connection of this equipment. When directed, remove the bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected.

### **3.05 PIPING CONNECTIONS**

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 and smaller, where indicated on Drawings, at final connection to each piece of equipment and at all control valves.
  - 2. Install flanges, in piping NPS 2-1/2 and larger, where indicated on Drawings, at final connection to each piece of equipment and at all control valves.

### **3.06 INSTALLATION OF PIPE CONCEALMENT SYSTEM**

- A. Install cover system, brackets, and cover components for piping according to manufacturer's "Installation Manual."

### **3.07 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS**

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated. Housekeeping pad locations and sizes shall be coordinated by mechanical contractor prior to the placement of concrete slabs.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

- E. For suspended equipment, furnish and install all inserts, rods, structural steel frames, brackets and platforms required. Obtain approval of Architect for same including loads, locations and methods of attachment.
- F. Equipment Rigging Over Roof Areas: Protect building structure against damage during equipment rigging. Make provisions to distribute load of equipment to main roof structure, and to prevent damage to roof decking, roofing, or purlins.
- G. The Contract Documents indicate items to be purchased and installed. The items are noted by a manufacturer's name, catalog number and/or brief description. The catalog number may not designate all the accessory parts for a particular application. Arrange with the manufacturer for the purchase of all items required for a complete installation.

### **3.08 PAINTING**

- A. Painting of mechanical systems, equipment, and components is specified in Division 09.
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### **3.09 CONCRETE BASES**

- A. Concrete housekeeping pads for floor mounted mechanical equipment shall be provided by Architectural Trades.
- B. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions.
  - 1. Construct concrete bases as shown on Drawings or specified, but not less than 4 inches larger in both directions than supported unit.
  - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
  - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
  - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
  - 7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section.

### **3.10 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 mechanical materials and equipment.
- C. Where pipe and/or equipment support members must be welded to structural building framing, Contractor shall seek prior approval from Architect and structural engineer. Scrape, brush clean, and apply one coat of zinc rich primer after welding.
- D. Field Welding: Comply with AWS D1.1.

### **3.11 EPOXY BONDING TO EXISTING MATERIALS**

- A. Use epoxy bonding compound to set sleeves or pipes in existing concrete to bond new concrete and/or grout to existing materials or to bond dissimilar materials.
- B. The compound, when applied in accordance with the manufacturer's instructions, shall be capable of initial curing within 48 hours at temperatures as low as 40 deg F and shall be capable of bonding any combination of the following properly prepared materials: Wet or dry, cured or uncured concrete or mortar; vitrified clay; cast iron and carbon steel.

### **3.12 JACKING OF PIPE**

- A. Do not jack pipe in place except upon prior approval of proposed materials and complete details of methods.

**3.13 ERECTION OF WOOD SUPPORTS AND ANCHORAGES**

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

**3.14 GROUTING**

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

**3.15 CUTTING, CORING AND PATCHING**

- A. Refer to Division 01 Specification Sections for requirements for cutting, coring, patching and refinishing work necessary for the installation of mechanical work.
- B. All cutting, coring, patching and repair work shall be performed by the Contractor through approved, qualified subcontractors. Contractor shall include full cost of same in bid.

**3.16 EXCAVATION AND BACKFILLING**

- A. Refer to Division 31 Specification Sections.
- B. Provide all excavation, trenching, tunneling and backfilling required for the mechanical work.
- C. Provide all pumping and/or well pointing required for the mechanical work.
- D. Provide foundations if required to support underground piping.
- E. Backfill all excavations with well-tamped granular material. Backfill all excavations under wall footings with lean mix concrete up to underside of footings and extend concrete within excavation a minimum of four (4) feet each side of footing. Granular backfill shall be placed in layers not more than 8 inches in thickness, 95 percent compaction throughout with approved compaction equipment. Tamp, roll as required. Excavated material shall not be used.

**3.17 FLASHING**

- A. Provide all flashing required for mechanical work. Refer to Division 07 Specification Sections.

**3.18 LUBRICATION**

- A. Provide all lubrication for the operation of the equipment until acceptance by the Owner. Contractor is responsible for all damage to bearings up to the date of acceptance of the equipment. Protect all bearings and shafts during installation. Thoroughly grease steel shafts to prevent corrosion. Provide covers as required for proper protection of all motors and other equipment during construction.

**3.19 FILTERS**

- A. Provide and maintain filters in air handling systems throughout the construction period and prior to final acceptance of the building. Do not run air handling equipment, without all prefilters and final filters as specified.
- B. Immediately prior to final building acceptance by the Owner, Contractor shall:
  - 1. Replace all disposable type air filters with new units.

**3.20 CLEANING**

- A. Each Mechanical Trade shall be responsible for removing all debris daily as required to maintain the work area in a neat, orderly condition.
- B. After equipment, steam, condensate and HVAC water piping systems have been completed and tested, each entire system shall be cleaned and flushed. Refer to Division 23 Section "Piping Systems Flushing and Chemical Cleaning" for requirements. Provide temporary bypass piping and fittings, temporary valves and strainers, temporary water make-up piping with approved means of backflow prevention, and temporary pumps as needed to perform specified flushing and cleaning requirements.
- C. Prior to connection of new HVAC piping to existing HVAC piping systems, all new piping shall be subject to initial flushing, cleaning and final flushing. Refer to Division 23 Section "Piping Systems Flushing and Chemical Cleaning" for requirements. Provide temporary bypass piping and fittings, temporary valves and strainers, temporary water make-up piping with approved means of backflow prevention, and temporary pumps as needed to perform specified flushing and cleaning requirements.
- D. Flushing, cleaning, and disinfection of domestic water piping is specified in Division 22 Section "Domestic Water Piping."
- E. Exterior surfaces of all piping, ductwork and equipment shall be wiped down to remove excess dirt and debris prior to concealment by Architectural Trades work.
- F. Upon completion of work in each respective area, clean and protect work. Just prior to final acceptance, perform additional cleaning as necessary to provide clean equipment and areas to the Owner.

**END OF SECTION 20 0510**

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  - 1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
  - 2. Division 21 Section "Fire-Suppression Piping" for pipe hangers for fire-protection piping.
  - 3. Division 20 Section "Mechanical General Requirements."
  - 4. Division 20 Section "Basic Mechanical Materials and Methods."
  - 5. Division 20 Section "Mechanical Vibration Controls" for vibration isolation devices.
  - 6. Division 20 Section "Pipe Expansion Fittings and Loops" for pipe guides and anchors.
  - 7. Division 23 Section(s) "Metal Ducts" for duct hangers and supports.

#### 1.02 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. MFMA: Metal Framing Manufacturers Association.

#### 1.03 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.

#### **1.04 SUBMITTALS**

- A. Product Data: For the following:
  - 1. Steel pipe hangers and supports.
  - 2. Thermal-hanger shield inserts.
- 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.
- C. Welding certificates.

#### **1.05 QUALITY ASSURANCE**

- A. MSS Standards: Pipe hangers, supports, and accessories shall comply with the following:
  - 1. MSS SP-58, Pipe Hangers and Supports – Materials, Design and Manufacture.
  - 2. MSS SP-69, Pipe Hangers and Supports – Selection and Application.
  - 3. MSS SP-89, Pipe Hangers and Supports – Fabrication and Installation Practices.
- B. Welding: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1, "Structural Welding Code--Steel."
  - 2. AWS D1.2, "Structural Welding Code--Aluminum."
  - 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
  - 4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
  - 5. ASME Boiler and Pressure Vessel Code: Section IX.

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

#### **2.02 HANGER ROD MATERIAL**

- A. Threaded, hot rolled, steel rod conforming to ASTM A 36 or A575.
  - 1. Rod continuously threaded.
  - 2. Use of rod couplings is prohibited.

#### **2.03 STEEL PIPE HANGERS AND SUPPORTS**

- A. Description: MSS SP-69, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article, and schedules and details on the Drawings for where to use specific hanger and support types.
  - 1. Hangers and Supports for Fire Protection Piping: UL listed or FMG approved.
- B. Manufacturers:
  - 1. Anvil International, Inc.
  - 2. B-Line by Eaton.
  - 3. Carpenter & Paterson, Inc.
  - 4. Hilti USA.
  - 5. Pentair Electrical & Fastening Solutions; CADDY.
  - 6. PHD Manufacturing, 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.



**2.04 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.

**2.05 METAL FRAMING SYSTEMS**

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Manufacturers:
1. Anvil International, Inc.; Anvil-Strut.
  2. B-Line by Eaton.
  3. Power-Strut; a part of Atkore International.
  4. Unistrut; a part of Atkore International.
  5. Hilti USA.
- C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
- D. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.
- E. Nonmetallic Coatings: Plastic coating, jacket, or liner.

**2.06 METAL INSULATION SHIELDS**

- A. Manufacturers:
1. Anvil International, Inc.
  2. B-Line by Eaton.
  3. Carpenter & Paterson, Inc.
  4. Pentair Electrical & Fastening Solutions; CADDY.
  5. PHD Manufacturing, Inc.
- B. Description: MSS SP-69, Type 40, protective shields. Shields shall span an arc of 180 degrees.
- C. Shield Dimensions for Pipe: Not less than the following:
1. NPS 1/4 to NPS 2: 12 inches long and 0.048 inch thick.

**2.07 PIPE COVERING PROTECTION SADDLES**

- A. Manufacturers:
1. Anvil International, Inc.
  2. B-Line by Eaton.
  3. Carpenter & Paterson, Inc.
  4. Pentair Electrical & Fastening Solutions; CADDY.
  5. PHD Manufacturing, Inc.
- B. Description: MSS SP-69, Type 39A and Type 39B, for suspension of insulated hot pipe where heat losses are to be kept to a minimum.
1. Saddles shall match insulation thickness.
  2. Saddle length: 12 inches.
  3. Furnish with center rib for pipe sized NPS 12 and larger.

**2.08 PLASTIC INSULATION SHIELDS**

- A. Manufacturers:
1. B-Line by Eaton; Snap'N Shield.
  2. Hydra-Zorb Company; Bronco.
- B. Description: Polypropylene copolymer protective shields designed to snap directly onto strut channel. Shields shall span an arc of 180 degrees.
1. Operating Temperature Range: Minus 40 deg F to plus 178 deg F.
- C. Certifications:
1. UL Classified for USA: UL-723 (ASTM E 84).
  2. UL listed for Canada: ULC-S102.2.
  3. Meets UL94 HB flammability standards.
- D. Shield Dimensions for Pipe: Not less than the following:
1. NPS 1/4 to NPS 2: 12 inches long.

## **2.09 THERMAL-HANGER SHIELDS**

- A. Manufacturers:
  - 1. American Mechanical Insulation Sales Inc. (AMIS).
  - 2. B-Line by Eaton.
  - 3. Pentair Electrical & Fastening Solutions; CADDY.
  - 4. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
  - 5. Rilco Manufacturing Company, Inc.
  - 6. Value Engineered Products, Inc.
- B. Description: Manufactured assembly consisting of insulation insert encased in 360 degree sheet metal shield.
  - 1. Minimum Compressive Strength of Insert Material:
    - a. 100-psig- for sizes smaller than NPS 6.
    - b. 600-psig- for sizes NPS 6 and larger.
- C. Insulation-Insert Material for Cold Piping: Full 360 degree, water-repellent treated, ASTM C 533, Type I calcium silicate with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: Full 360 degree, water-repellent treated, ASTM C 533, Type I calcium silicate.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.
- F. Include carbon steel ASTM A36 load distribution plates as required by load, pipe movement, hanger style, and hanger spacing.
- G. Thermal-Hanger Shields for Flexible Foamed Elastomeric Insulated Piping:
  - 1. Manufacturer:
    - a. B-Line by Eaton/Armacell; Armafix IPH.
  - 2. Insulation-Insert Material for Copper Piping with Flexible Foamed Elastomeric Insulation: Use the following:
    - a. Flexible foamed elastomeric, ASTM 534, Type I-Tubular Grade 1 with PUR/PIP support inserts.
- H. Thermal-Hanger Shields for Small Diameter Piping:
  - 1. Manufacturer:
    - a. Hydra-Zorb Company; Klo-Shure Insulation Couplings.
  - 2. Insulation-Insert Material for Small Diameter Piping with Flexible Foamed Elastomeric or Glass Fiber Insulation: Use the following:
    - a. Rigid Hytel thermoplastic insulation coupling designed for use with pipe or tube NPS 4 and smaller, and insulation from 3/8 inch to 1-1/2 inch thick.

## **2.10 FASTENER SYSTEMS**

- A. 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 by Eaton.
    - b. Empire Industries, Inc.
    - c. Hilti, Inc.
    - d. ITW Ramset/Red Head.
    - e. MKT Fastening, LLC.
    - f. Powers Fasteners.
- B. Chemical Fasteners: Insert-type-stud bonding system anchor for use with hardened portland cement concrete, and tension and shear capacities appropriate for application. Exception: Do not use chemical fasteners to support hanger systems for fire protection piping.
  - 1. Manufacturers:
    - a. Hilti, Inc.
    - b. ITW Ramset/Red Head.
    - c. MKT Fastening, LLC.
    - d. Powers Fasteners.

2. Bonding Material: ASTM C 881, Type IV, Grade 3, 2-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
3. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud, unless otherwise indicated.
4. Washer and Nut: Zinc-coated steel.
- C. Threaded Inserts: Galvanized malleable iron or galvanized steel for 3/4 inch bolts.
  1. Manufacturers:
    - a. Superior Concrete Accessories; Threaded Insert.
    - b. Dayton Sure-Grip and Shore Co.
    - c. Richmond Screw Anchor Co.
- D. Slotted Inserts: Continuous galvanized steel with temporary slot fillers and complete with nuts, studs, washers and the like, for 3/4 inch bolts.
  1. Manufacturers:
    - a. B-Line by Eaton; B22-I Continuous Concrete Insert.
    - b. Hilti, Inc.; CIS13812/PG.
    - c. Hohman and Barnard, Inc.
    - d. Richmond Screw Anchor Co.
    - e. Unistrut; a part of Atkore International; P-3200 Continuous Insert.

## **2.11 ROOF MOUNTED PIPING SUPPORTS**

- A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Low, Fixed-Height, Single-Base Stand: Assembly of base and horizontal member, and pipe support, for roof installation without membrane penetration.
  1. Manufacturers:
    - a. B-Line by Eaton; Dura-Blok.
    - b. Eco Support Products.
    - c. MIFAB, Inc.; C-Port.
    - d. MIRO Industries; Conduit and Condensate Supports.
    - e. nVent Electric plc; CADDY.
    - f. Portable Pipe Hangers.
  2. Base: Plastic, stainless steel, or recycled rubber.
  3. Horizontal Member: Cadmium-plated-steel or galvanized-steel strut designed for use with standard strut clamps and accessories.
- C. Low, Adjustable-Height, Single-Base Stand: Assembly of base, horizontal member, and adjustable vertical members, and pipe support, for roof installation without membrane penetration.
  1. Manufacturers:
    - a. B-Line by Eaton; Dura-Blok.
    - b. Eco Support Products.
    - c. MIFAB, Inc.; C-Port.
    - d. MIRO Industries; Conduit and Condensate Supports.
    - e. nVent Electric plc; CADDY.
    - f. Portable Pipe Hangers.
  2. Base: Plastic, stainless steel, or recycled rubber.
  3. Horizontal Member: Cadmium-plated-steel or galvanized-steel strut designed for use with standard strut clamps and accessories.
  4. Vertical Members: Threaded, hot rolled, steel rod conforming to ASTM A 36 or A575 with cadmium plated nuts and washers. Rod continuously threaded.
- D. High, Adjustable-Height, Single-Base Stand: Assembly of base, horizontal member, and adjustable vertical members, and clevis type pipe support, for roof installation without membrane penetration.
  1. Manufacturers:
    - a. B-Line by Eaton; Dura-Blok.
    - b. Eco Support Products.
    - c. MIFAB, Inc.; C-Port.

- d. MIRO Industries; Water and Steam Supports.
  - e. nVent Electric plc; CADDY.
  - f. Portable Pipe Hangers.
- 2. Base: Plastic, stainless steel, or recycled rubber.
- 3. Horizontal Member: Cadmium-plated-steel or galvanized-steel strut designed for use with standard strut clamps and accessories.
- 4. Vertical Members: Threaded, hot rolled, steel rod conforming to ASTM A 36 or A575 with cadmium plated nuts and washers. Rod continuously threaded.
- E. Low, Fixed-Height, Single-Base Roller Stand: Assembly of base and horizontal roller, for roof installation without membrane penetration.
  - 1. Manufacturers:
    - a. B-Line by Eaton; Dura-Blok.
    - b. Eco Support Products.
    - c. MIFAB, Inc.; C-Port.
    - d. MIRO Industries; Gas and Mechanical Supports.
    - e. nVent Electric plc; CADDY.
    - f. Portable Pipe Hangers.
  - 2. Base: Plastic, stainless steel, or recycled rubber.
  - 3. Horizontal Member: Cadmium-plated-steel rod and corrosion resistant roller designed for use with standard accessories.
- F. Low, Adjustable-Height, Single-Base Roller Stand: Assembly of base and horizontal roller, for roof installation without membrane penetration.
  - 1. Manufacturers:
    - a. B-Line by Eaton; Dura-Blok.
    - b. Eco Support Products.
    - c. MIFAB, Inc.; C-Port.
    - d. MIRO Industries; Gas and Mechanical Supports.
    - e. nVent Electric plc; CADDY.
    - f. Portable Pipe Hangers.
  - 2. Base: Plastic, stainless steel, or recycled rubber.
  - 3. Horizontal Member: Cadmium-plated-steel rod and corrosion resistant roller designed for use with standard accessories.
  - 4. Vertical Members: Threaded, hot rolled, steel rod conforming to ASTM A 36 or A575 with cadmium plated nuts and washers. Rod continuously threaded.
- G. High, Multiple-Base Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
  - 1. Manufacturer:
    - a. B-Line by Eaton; Dura-Blok.
    - b. Eco Support Products.
    - c. MIFAB, Inc.; C-Port.
    - d. MIRO Industries; Water and Steam Supports.
    - e. nVent Electric plc; CADDY.
    - f. Portable Pipe Hangers.
  - 2. Bases: Two or more plastic, steel, or recycled rubber.
  - 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.
- H. Custom, Multiple-Base Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports or rollers, for roof installation without membrane penetration.
  - 1. Manufacturer:
    - a. B-Line by Eaton; Dura-Blok.
    - b. Eco Support Products.
    - c. MIFAB, Inc.; C-Port.
    - d. MIRO Industries; Custom Design Products.
    - e. nVent Electric plc; CADDY.
    - f. Portable Pipe Hangers.

2. Bases: Four or more plastic, steel, or recycled rubber.
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.
6. Pipe Rollers: Cadmium-plated-steel rod and corrosion resistant roller designed for use with standard accessories.
- I. Curb-Mounting 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.
  1. Roof Curb Type Supports: Coordinate installation and type with Architectural Trades. Top shall be level and extend a minimum of 10 inches above top of roof insulation.
    - a. Manufacturers:
      - 1) Pate.
      - 2) Thybar; Thycurb.
      - 3) Roof Products and Systems.
      - 4) Greenheck.
      - 5) Creative Metals.

## **2.12 EQUIPMENT SUPPORTS**

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

## **2.13 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. Refer to application schedules on the Drawings.
- B. For insulated pipe, oversize hanger elements to accommodate insulation thickness.
- C. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- D. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- E. Use hangers and supports with galvanized, metallic coatings for outdoor applications or where exposed to outdoor conditions.
- F. Use hangers and supports with plastic coating, or galvanized metallic coatings for applications in corrosive atmospheres.
- G. Use metal framing, with plastic coating, or galvanized metallic coatings for metal framing in corrosive atmospheres.
- H. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- I. Use padded hangers for piping that is subject to scratching.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. MSS Type 8 or spring type to meet system requirements.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches 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.
- L. Concrete Structure Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Anchor Devices, Concrete and Masonry: in accordance with Group I, Group II, Type 2, Class 2, Style 1 and Style 2, Group III and Group VIII or FS FF-S-325A. Furnish cast-in floor type equipment anchor devices with adjustable positions. Furnish built in anchor devices for masonry, unless otherwise approved by the Architect. Powder actuated anchoring devices shall not be used to support any mechanical systems components.
  2. Inserts, Concrete: TYPE 18 or 19. When applied to loads equivalent to piping in sizes NPS 2 and larger, and where otherwise required by imposed loads, a one foot length of 1/2 inch reinforcing rod shall be inserted and wired through wing slots. Proprietary type continuous inserts may be proposed and shall be submitted for approval.
  3. Use mechanical-expansion anchors where required in concrete construction.
  4. Use chemical fasteners where required in concrete construction.
- M. Steel Frame Structure Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Beam Clamps:
    - a. Center Loading: TYPE 21, 28, 29 and 30, unless otherwise indicated. Type 27 shall be allowed to support single pipes NPS 6 size or smaller only.
    - b. "C" Clamps: Type 19, 20 or 23, for supporting single pipes NPS 2-1/2 size or smaller only. Use of "C" clamps, or beam clamps of "C" pattern, or any modification thereof, is prohibited for supporting multiple pipes or pipes larger than NPS 2-1/2.
- N. Hanger-Rod Attachments for Wood Construction: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. All Steel Ceiling Plates: UL listed and suitable for attachment to wood beams. For pipe sizes NPS 1/2 to NPS 2. Install in accordance with manufacturer's instructions to maintain listing.
  2. Threaded Side Beam Brackets: UL listed and FMG approved, suitable for attachment to wood beams. For pipe sizes NPS 2 to NPS 4. Install in accordance with manufacturer's instructions to maintain listing.
- O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  1. Use spring supports and sway braces TYPES 48, 49, 50, 51, 52, 53, 54, 55 or 56. For specific points:
    - a. Provide spring supports at point of support where vertical movement will occur.
    - b. For light loads and vertical movement less than 1/4 inch, TYPES 48 or 49 spring cushion supports.
    - c. For vertical movements in excess of 1/4 inch but less than 1/2 inch, TYPES 51, 52 or 53 variable spring supports shall be used, loaded to not more than 75 percent of published load rating.
    - d. For vertical movements of 1/2 inch and more, TYPES 54, 55 and 56 constant support spring hangers.
    - e. Sway braces; TYPE 50.
    - f. Variable spring hangers in accordance with referenced MSS Standards with "medium" allowable load change.
- P. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- Q. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

### **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 structural frame.
- B. Provide necessary piping and equipment supporting elements including: building structure attachments, supplementary steel, hanger rods, stanchions and fixtures, vertical pipe attachments, horizontal pipe attachments, anchors, guides, spring supports in accordance with the referenced codes, standards, and requirements specified. Support piping and equipment from building structure, not from roof deck, floor slab, other pipe, duct or equipment.
- C. At connections between piping systems, hangers and equipment of dissimilar metals, insulate, using dielectric insulating material, nonferrous piping against direct contact with the building steel by insulating the contact point of the hanger and pipe or the hanger and building steel. Test each point of dielectric insulation with an ohm meter to ensure proper isolation of dissimilar materials. Test shall be observed by the Owner's Representative and/or Architect.
- D. Use copper plated or plastic coated supporting element in contact with copper tubing or glass piping.
- E. File and paint cut ends and shop or field prime paint supporting element components.
- F. Hang piping parallel with the lines of the building, unless otherwise indicated. Route piping in an orderly manner and maintain gradient. Space piping and components so a threaded pipe fitting may be removed between adjacent pipes and so there will be not less than 1/2 inch of clear space between finished surfaces and piping. Arrange hangers on adjacent parallel service lines in line with each other.
- G. Flange loads on connected equipment shall not exceed 75 percent of maximum allowed by equipment manufacturer. Flange loads in liquid containing systems shall be checked in the presence of the Architect when piping is full of liquid. No flange load is allowed on pumps, vibration isolated equipment or flexible connectors.
- H. Spring supports, within specified limitations: Constant support type, where necessary to avoid transfer of load from support to support or onto connected equipment; otherwise, variable support type located at points subject to vertical movement.
- I. Incorporate pipe anchors into piping systems to maintain permanent pipe positions. Install alignment guides for the piping adjacent to and on each side of pipe expansion loops and expansion joints to maintain alignment.
- J. Where necessary, brace piping and supports against reaction, sway and vibration.
- K. Do not hang piping from concrete joist pans, floor decks, roof decks, equipment, ductwork, or other piping.
- L. Install turnbuckles, swing eyes and clevises to accommodate temperature changes, pipe accessibility, and adjustment for load pitch. Rod couplings are not acceptable.
- M. Install hangers and supports for piping at intervals specified, at locations not more than 3 feet from the ends of each runout, not more than 3 feet from connections to equipment, and not over 25 percent of specified interval from each change in direction of piping and for concentrated loads such as valves, etc.
- N. Base the load rating for pipe support elements on loads imposed by insulated weight of pipe filled with water. The span deflection shall not exceed slope gradient of pipe.
- O. If structural steel, roofs, or tunnels will allow support spacing greater than that shown above, Contractor shall submit proposed support system along with structural calculations documenting the allowance of such spacing, in accordance with ANSI, B31.1, and MSS Guidelines.
- P. Support vertical risers independently of connected horizontal piping whenever practical, with supports at the base and at intervals to accommodate system range of load with thermal conditions. Support vertical risers at each floor penetration for piping in shafts or chases. Guide for lateral stability. Fit horizontal piping connected to moving risers with two spring supports connected adjacent to riser, spaced according to required hanger spacing.
- Q. For risers at temperatures of 100 deg F or less place riser clamps under fittings. Support carbon steel pipe at each operating level or floor and at not more than 15-foot intervals for pipe 2 inches and smaller, and at not more than 20 foot intervals for pipe 2-1/2 inches and larger.
- R. After the piping systems have been installed, tested and placed in satisfactory operation, firmly tighten hanger rod nut and jam nut and upset threads to prevent movement of fasteners.

- S. Attach pipe anchors and pipe alignment guides to the building structure where indicated. If not indicated, the method used is optional to the Contractor, subject to approval by the Architect. In the case of structural steel, make attachment by clamping in accordance with the American Institute of Steel Construction Specification for the Design, Fabrication and Erection of Structural Steel for Building.
- T. Attach supporting elements connected to structural steel columns to preclude vertical slippage and cascading failure.
- U. Attach pipe hangers and other supporting elements to roof purlins and trusses at panel points.
- V. Where eccentric loading beam clamps are approved and where other work is supported by similar eccentric loading support element from the same structural member, locate eccentric loading support elements to minimize structural member torsion load.
- W. Limit the location of supporting elements for piping and equipment, when supported from roof, to panel points of the bar joists.
- X. Building structure shall not be reinforced except as approved by the Architect in writing.
- Y. Use approved cast-in-place inserts or built-in anchors for attachment to concrete structure. Size inserts and anchors for the total applied load with a safety factor in accordance with applicable codes but in no case less than 5. Coordinate installation of all imbedded items in accordance with manufacturer's instructions. Position anchorage and imbedded items as indicated and/or where required and support against displacement during placing of concrete. Cutting or repositioning of concrete beam or girder or reinforcing steel to accommodate inserts will not be allowed. Provide removable closures in imbedded device openings to prevent entry of concrete.
- Z. Support piping and equipment from concrete building frame, not from roof or floor slabs unless otherwise indicated.
- AA. Use cast-in-place inserts in concrete beams and girders. Drilled anchors/wedge type inserts shall be used on vertical surfaces only. Coordinate with structural engineer.
- BB. Attach piping supports to the side of concrete beams and concrete joist. Provide supplementary support steel as required. Cast-in-place or drilled anchors will not be permitted in the bottom of concrete beams and concrete joist.
- CC. Attach piping supports to the side of concrete beams or concrete joist. Where intermediate hangers are required to meet the hanger spacing schedule, the Contractor may propose attachment of intermediate pipe supports to the bottom of the concrete slab pending submittal of a satisfactory pull out test. The Contractor shall submit pull out test criteria, pull out test results, proposed hanger detail and hanger point loads to the Architect for written approval.
- DD. 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.
- EE. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- FF. Fastener System Installation:
  - 1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- GG. Roof-Mounting Pipe and Equipment Stand Installation:
  - 1. Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
  - 2. Curb or Rail Mounting Type Stands: Assemble components or fabricate stand and mount on permanent, stationary roof curb or rail. Refer to Division 07 Section "Roof Accessories" for curb and rail installation.
  - 3. Maintain support manufacturer's recommended spacing.
- HH. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- II. Equipment Support Installation: Fabricate from welded-structural-steel shapes.



- JJ. Install hangers and supports to allow controlled thermal 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.
- KK. Install lateral bracing with pipe hangers and supports to prevent swaying.
- LL. 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.
- MM. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- NN. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- OO. Refer to individual piping sections for hanger spacing and hanger rod sizes.

### **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. Equipment Supports: Painting is specified in Division 09 painting Sections.
- C. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.
- D. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

## **END OF SECTION 20 0529**

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  1. Division 20 Section "Mechanical General Requirements."

#### 1.02 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Valve numbering scheme.
- D. Valve Schedules: For each piping system. Furnish extra copies (in addition to mounted copies) to include in Maintenance Manuals.

#### 1.03 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME (ANSI) A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

#### 1.04 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with location of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified:
1. Seton.
  2. Brady.
  3. EMED.
  4. Craftmark.
  5. Brimar Industries, Inc.
  6. Marking Services Inc. (MSI).
  7. Kolbi Pipe Marker Co.

### **2.02 EQUIPMENT IDENTIFICATION DEVICES**

- A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
1. Data:
    - a. Manufacturer, product name, model number, and serial number.
    - b. Capacity, operating and power characteristics, and essential data.
    - c. Labels of tested compliances.
  2. Location: Accessible and visible.
  3. Fasteners: As required to mount on equipment.
- B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
1. Terminology: Match schedules as closely as possible.
  2. Data:
    - a. Name and plan number.
    - b. Equipment service.
    - c. Design capacity.
    - d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
  3. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.
- C. Access Panel and Door Markers: 1/16-inch- thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch center hole for attachment.
1. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

### **2.03 PIPING IDENTIFICATION DEVICES**

- A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.
1. Colors: Comply with ASME (ANSI) A13.1, unless otherwise indicated.
  2. Type and Size of Letters: Comply with ANSI A13.1, unless otherwise indicated.
  3. Legends: Spelled out in full or commonly used and accepted abbreviations.
  4. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
  5. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
  6. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
- B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.
- C. Shaped Pipe Markers: Preformed semirigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.

**2.04 DUCT IDENTIFICATION DEVICES**

- A. Duct Markers: Vinyl, 2-inch minimum character height, with permanent pressure sensitive adhesive. Include direction and quantity of airflow, air handling unit or fan number, and duct service (such as supply, return, and exhaust).

**2.05 HAZARDOUS MATERIAL IDENTIFICATION DEVICES**

- A. Standard: NFPA 704.
- B. Material: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive; or mounting screws.
- C. Size: Minimum 7-1/2 inches by 7-1/2 inches with 3-inch character height.
- D. Content: Appropriate for refrigerant.

**2.06 VALVE TAGS**

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme to match existing numbering scheme. Provide 5/32-inch hole for fastener.
  - 1. Material: 0.032-inch- thick brass.
  - 2. Valve-Tag Fasteners: Brass wire-link chain or beaded chain.

**2.07 VALVE SCHEDULES**

- A. Valve Schedules: For each piping system, on standard-size bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
  - 1. Valve-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws.
  - 2. Frame: Finished hardwood or extruded aluminum.
  - 3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

**PART 3 - EXECUTION**

**3.01 APPLICATIONS, GENERAL**

- A. Products specified are for applications referenced in other Division 20, 21, 22, and 23 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

**3.02 EQUIPMENT IDENTIFICATION**

- A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:
  - 1. Fuel-burning units, including boilers and water heaters.
  - 2. Pumps, compressors, chillers, and similar motor-driven units.
  - 3. Heat exchangers, coils, evaporators, heat recovery units, and similar equipment.
  - 4. Fans, blowers, primary balancing dampers, and mixing boxes.
  - 5. Packaged HVAC units.
- B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.
  - 1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:
  - a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
  - b. Fire department hose valves and hose stations.
  - c. Meters, gages, thermometers, and similar units.
  - d. Fuel-burning units, including boilers and water heaters.
  - e. Pumps, compressors, chillers, and similar motor-driven units.
  - f. Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
  - g. Fans, blowers, primary balancing dampers, and mixing boxes.
  - h. Packaged HVAC units.
  - i. Tanks and pressure vessels.
  - j. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.
- C. Install access panel markers with screws on equipment access panels.
- D. Area Served: Equipment serving different areas of a building other than where the equipment is installed shall be permanently marked in a manner that, in addition to identifying the equipment as specified in this Section, also identifies the area it serves.

### **3.03 PIPING IDENTIFICATION**

- A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
  1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pretensioned pipe markers. Use size to ensure a tight fit.
  2. Pipes with OD, Including Insulation, 6 Inches and Larger: Shaped pipe markers. Use size to match pipe and secure with fasteners.
- B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:
  1. Near each valve and control device.
  2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.
  4. At access doors, manholes, and similar access points that permit view of concealed piping.
  5. Near major equipment items and other points of origination and termination.
  6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
  7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

### **3.04 DUCT IDENTIFICATION**

- A. Identify ductwork with vinyl markers and flow direction arrows.
- B. Locate markers at air handling units, each side of floor and wall penetrations, near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

### 3.05 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:
  - 1. Valve-Tag Size and Shape:
    - a. Cold Water: Minimum 1-1/2 inches, round or square.
    - b. Hot Water: Minimum 1-1/2 inches, round or square.
    - c. Fire Protection: Minimum 1-1/2 inches, round or square.
    - d. Gas: Minimum 1-1/2 inches, round or square.

### 3.06 VALVE-SCHEDULE INSTALLATION

- A. Mount valve schedule on wall in accessible location in each major equipment room.

### 3.07 HAZARDOUS MATERIAL IDENTIFICATION DEVICES

- A. Mount to wall or door of room containing hazard. Indicate classification of refrigerant or other hazard.

### 3.08 ADJUSTING

- A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

### 3.09 CLEANING

- A. Clean faces of mechanical identification devices and glass frames of valve schedules.

### 3.10 SCHEDULES

- A. Paint colors are listed here for reference only. Painting is specified under Division 09.

#### PIPE LABELING AND COLOR CODING

<u>Pipe System Label</u>	<u>Drawing Abbrev.</u>	<u>Labels</u>	<u>Piping</u>
Sanitary Sewer	SAN	White on Green	Dark Brown
Sanitary Vent	V	White on Green	Dark Brown
Rain Conductor	RC	White on Green	Dark Brown
Domestic Cold Water	CW	White on Green	Light Green
Non-Potable Cold Water	NPCW	Black on Yellow	
Domestic Hot Water	HW	Black on Yellow	Dark Green
Domestic Hot Water Return	HWR	Black on Yellow	Dark Green
Natural Gas	G	Black on Yellow	Yellow
Hot Water Htg. Supply	HWHS	Black on Yellow	Dark Blue
Hot Water Htg. Return	HWHR	Black on Yellow	Dark Blue
Terminal Unit Heating Sup.	THS	Black on Yellow	Dark Blue
Terminal Unit Heating Ret.	THR	Black on Yellow	Dark Blue
Energy Recovery Loop Sup.	ERLS	Black on Yellow	Dark Blue
Energy Recovery Loop Ret.	ERLR	Black on Yellow	Dark Blue
Chilled Water Supply	CHWS	White on Green	Light Blue
Chilled Water Return	CHWR	White on Green	Light Blue
Refrigerant Liquid	RL	Black on Yellow	
Refrigerant Suction	RS	Black on Yellow	
Fire Protection	FP	White on Red	Bright Red

SHEET METAL WORK

<u>Service</u>	<u>Abbrev.</u>	<u>Labels</u>	<u>Ductwork</u>
Air Conditioning Supply	Supply Air	White on Green	White
Air Conditioning Return	Return Air	White on Green	White
Exhaust Systems	Exhaust Air	Black on Yellow	Green
Outside Air Intake	Outside Air	White on Green	White
Mixed Air	Mixed Air	White on Green	White

**END OF SECTION 20 0553**



## SECTION 20 0700 - MECHANICAL INSULATION

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### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  1. Division 20 Section "Mechanical General Requirements."
  2. Division 20 Section "Basic Materials and Methods."

3. Division 20 Section "Hanger and Supports" for thermal hanger shield inserts.
4. Division 22 Section "Plumbing Fixtures: for protective shielding guards.
5. Division 23 Section "Metal Ducts" for duct liners.

## **1.02 SUMMARY**

- A. This Section includes mechanical insulation for pipe, duct, and equipment.

## **1.03 DEFINITIONS**

- A. ASJ: All-service jacket.  
B. FSK: Foil, scrim, kraft paper.  
C. PVC: Polyvinyl Chloride.  
D. SSL: Self-sealing lap.

## **1.04 INDOOR PIPING INSULATION SYSTEMS DESCRIPTION**

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are scheduled on the Drawings, or identified for each piping system and pipe size range.

## **1.05 OUTDOOR, ABOVEGROUND PIPING INSULATION SYSTEMS DESCRIPTION**

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are scheduled on the Drawings, or identified for each piping system and pipe size range.

## **1.06 INDOOR DUCT AND PLENUM INSULATION SYSTEMS DESCRIPTION**

- A. Acceptable indoor duct and plenum insulation materials and thicknesses are scheduled on the Drawings.

## **1.07 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SYSTEMS DESCRIPTION**

- A. Acceptable outdoor duct and plenum insulation materials and thicknesses are scheduled on the Drawings.

## **1.08 EQUIPMENT INSULATION SYSTEMS DESCRIPTION**

- A. Acceptable equipment insulation materials and thicknesses are scheduled on the Drawings.

## **1.09 FIELD-APPLIED JACKETING SYSTEMS DESCRIPTION**

- A. Acceptable field-applied jacketing materials and thicknesses are scheduled on the Drawings.

## **1.10 SUBMITTALS**

- A. Product Data: For each type of product indicated, identify thermal conductivity, thickness, and jackets (both factory and field applied, if any).
- B. LEED Submittals:
1. Product Data for Credit IEQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content and chemical components.
  2. Laboratory Test Reports for Credit IEQ 4: For adhesives and sealants, documentation indicating that product complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: Show details for the following:
1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
  2. Attachment and covering of heat tracing inside insulation.
  3. Insulation application at pipe expansion joints for each type of insulation.
  4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
  5. Removable insulation at piping specialties, equipment connections, and access panels.
  6. Application of field-applied jackets.

7. Application at linkages of control devices.
8. Field application for each equipment type
9. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

#### **1.11 QUALITY ASSURANCE**

- A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
  1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- B. Ductwork Maximum Temperature Limits: Based on ASTM C 411 test procedures.

#### **1.12 DELIVERY, STORAGE, AND HANDLING**

- A. Prior to installation, protect insulation from exposure to water and from physical damage. Prior to installation, store insulation in manufacturer's original packaging.

#### **1.13 COORDINATION**

- A. Coordinate size and location of supports, hangers, and pre-insulated pipe shields/supports specified in Division 20 Section "Hangers and Supports."
- B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

#### **1.14 SCHEDULING**

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

### **PART 2 PRODUCTS**

#### **2.01 INSULATION MATERIALS, GENERAL REQUIREMENTS**

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- E. Adhesives used shall be fire resistant in their dry states and UL listed.

#### **2.02 PIPE INSULATION MATERIALS**

- A. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
  1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Armacell LLC; AP Armaflex.

- b. IK Insulation Group; K-Flex USA LLC; Insul-Tube and Insul-Sheet.
  - B. Glass-Fiber, Preformed Pipe Insulation, Type I:
    - 1. Products: Subject to compliance with requirements, provide one of the products specified.
      - a. Johns Manville; Micro-Lok.
      - b. Knauf Insulation; 1000 Pipe Insulation.
      - c. Manson Insulation Inc.; Alley-K.
      - d. Owens Corning; Fiberglas Pipe Insulation.
    - 2. Type I, 850 deg F Materials: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ or ASJ-SSL. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
      - a. CertainTeed Corp.; CrimpWrap.
      - b. Johns Manville; MicroFlex.
      - c. Knauf Insulation; Pipe and Tank Insulation.
      - d. Manson Insulation Inc.; AK Flex.
      - e. Owens Corning; Fiberglas Pipe and Tank Insulation.

## **2.03 DUCTWORK INSULATION MATERIALS**

- A. Blanket Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. CertainTeed Corp.; Duct Wrap.
    - b. Johns Manville; Microlite.
    - c. Knauf Insulation; Duct Wrap.
    - d. Manson Insulation Inc.; Alley Wrap FSK.
    - e. Owens Corning; All-Service Duct Wrap.
- B. Board Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. CertainTeed Corp.; Commercial Board.
    - b. Fibrex Insulations Inc.; FBX.
    - c. Johns Manville; 800 Series Spin-Glas.
    - d. Knauf Insulation; Insulation Board.
    - e. Manson Insulation Inc.; AK Board.
    - f. Owens Corning; Fiberglas 700 Series.

## **2.04 EQUIPMENT INSULATION MATERIALS**

- A. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Armacell LLC; AP Armaflex.
    - b. IK Insulation Group; K-Flex USA LLC; Insul-Sheet and Insul-Tube.
- B. Board Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For equipment applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. CertainTeed Corp.; Commercial Board.
    - b. Fibrex Insulations Inc.; FBX.
    - c. Johns Manville; 800 Series Spin-Glas.
    - d. Knauf Insulation; Insulation Board.
    - e. Manson Insulation Inc.; AK Board.
    - f. Owens Corning; Fiberglas 700 Series.
- C. Large Diameter Pipe and Tank Insulation: Glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA

Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the products specified.
  - a. CertainTeed Corp.; CrimpWrap.
  - b. Johns Manville; MicroFlex.
  - c. Knauf Insulation; Pipe and Tank Insulation.
  - d. Manson Insulation Inc.; AK Flex.
  - e. Owens Corning; Fiberglas Pipe and Tank Insulation.

## **2.05 INSULATING CEMENTS**

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
  1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Insulco, Division of MFS, Inc.; Triple I.
    - b. P. K. Insulation Mfg. Co., Inc.; Super-Stik.
- B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
  1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. P. K. Insulation Mfg. Co., Inc.; Thermal-V-Kote.
- C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.
  1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Insulco, Division of MFS, Inc.; SmoothKote.
    - b. P. K. Insulation Mfg. Co., Inc.; PK No. 127, and Quik-Cote.
    - c. Rock Wool Manufacturing Company; Delta One Shot.

## **2.06 ADHESIVES**

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to it and to surfaces to be insulated, unless otherwise indicated.
- B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
  1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Armacell LCC; 520 Adhesive.
    - b. Foster Products Corporation, H. B. Fuller Company; 85-75.
    - c. RBX Corporation; Rubatex Contact Adhesive.
  1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
  1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Childers Products, H.B. Fuller Company; CP-82.
    - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
    - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
    - d. Marathon Industries, Inc.; 225.
    - e. Mon-Eco Industries, Inc.; 22-25.
    - f. Vimasco Corporation.
  1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
  1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Childers Products, H.B. Fuller Company; CP-82.

- b. Foster Products Corporation, H. B. Fuller Company; 85-20.
  - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
  - d. Marathon Industries, Inc.; 225.
  - e. Mon-Eco Industries, Inc.; 22-25.
- 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. PVC Jacket Adhesive: Compatible with PVC jacket.
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Dow Chemical Company (The); 739, Dow Silicone.
    - b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
    - c. P.I.C. Plastics, Inc.; Welding Adhesive.
    - d. Red Devil, Inc.; Celulon Ultra Clear.
    - e. Speedline Corporation; Speedline Vinyl Adhesive.
  - 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.07 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Childers Products, H.B. Fuller Company; CP-35.
    - b. Foster Products Corporation, H. B. Fuller Company; 30-90.
    - c. ITW TACC, Division of Illinois Tool Works; CB-50.
    - d. Marathon Industries, Inc.; 590.
    - e. Mon-Eco Industries, Inc.; 55-40.
    - f. Vimasco Corporation; 749.
  - 2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
  - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
  - 4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
  - 5. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Childers Products, H.B. Fuller Company; CP-10.
    - b. Foster Products Corporation, H. B. Fuller Company; 35-00.
    - c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
    - d. Marathon Industries, Inc.; 550.
    - e. Mon-Eco Industries, Inc.; 55-50.
    - f. Vimasco Corporation; WC-1/WC-5.
  - 2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
  - 3. Service Temperature Range: Minus 20 to plus 200 deg F.
  - 4. Solids Content: 63 percent by volume and 73 percent by weight.
  - 5. Color: White.

## 2.08 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Childers Products, H.B. Fuller Company; CP-52.

- b. Foster Products Corporation, H. B. Fuller Company; 81-42.
  - c. Marathon Industries, Inc.; 130.
  - d. Mon-Eco Industries, Inc.; 11-30.
  - e. Vimasco Corporation; 136.
2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
3. Service Temperature Range: Minus 50 to plus 180 deg F.
4. Color: White.

## **2.09 SEALANTS**

- A. FSK and Metal Jacket Flashing Sealants:
  1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Childers Products, H.B. Fuller Company; CP-76-8.
    - b. Foster Products Corporation, H. B. Fuller Company; 95-44.
    - c. Marathon Industries, Inc.; 405.
    - d. Mon-Eco Industries, Inc.; 44-05.
    - e. Vimasco Corporation; 750.
  2. Materials shall be compatible with insulation materials, jackets, and substrates.
  3. Fire- and water-resistant, flexible, elastomeric sealant.
  4. Service Temperature Range: Minus 40 to plus 250 deg F.
  5. Color: Aluminum.
  6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
  1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Childers Products, H.B. Fuller Company; CP-76.
  2. Materials shall be compatible with insulation materials, jackets, and substrates.
  3. Fire- and water-resistant, flexible, elastomeric sealant.
  4. Service Temperature Range: Minus 40 to plus 250 deg F.
  5. Color: White.
  6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## **2.10 FACTORY-APPLIED JACKETS**

- A. Insulation systems indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
  1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
  2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
  3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

## **2.11 FIELD-APPLIED FABRIC-REINFORCING MESH**

- A. Woven Glass-Fiber Fabric for Pipe Insulation: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch for covering pipe and pipe fittings.
  1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Vimasco Corporation; Elastafab 894.
    - b. Or approved equal.

- B. Woven Glass-Fiber Fabric for Duct and Equipment Insulation: Approximately 6 oz./sq. yd. with a thread count of 5 strands by 5 strands/sq. inch for covering equipment.
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Childers Products, H.B. Fuller Company; Chil-Glas No. 5.
    - b. Or approved equal.
- C. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch, in a Leno weave, for duct, equipment, and pipe.
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Foster Products Corporation, H. B. Fuller Company; Mast-A-Fab.
    - b. Vimasco Corporation; Elastafab 894.

## **2.12 FIELD-APPLIED CLOTHS**

- A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd.
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.
    - b. Lewco Products.
    - c. Mid-Mountain.
    - d. TCI.

## **2.13 FIELD-APPLIED JACKETS**

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as specified; roll stock ready for shop or field cutting and forming.
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Johns Manville; Zeston and Ceel-Co.
    - b. P.I.C. Plastics, Inc.; FG Series.
    - c. Proto PVC Corporation; LoSmoke.
    - d. Speedline Corporation; SmokeSafe.
  - 2. Adhesive: As recommended by jacket material manufacturer.
  - 3. Color: White.
  - 4. Factory-fabricated tank heads and tank side panels.
- C. PVC Fitting Covers: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C, and including flexible glass fiber insulation inserts.
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Johns Manville; Zeston and Ceel-Co.
    - b. P.I.C. Plastics, Inc.; FG Series.
    - c. Proto PVC Corporation; LoSmoke.
    - d. Speedline Corporation; SmokeSafe.
  - 2. Adhesive: As recommended by manufacturer.
  - 3. Color: White.
  - 4. Factory-fabricated fitting covers:
    - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, and mechanical joints.
- D. Metal Jacket:
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. PABCO-Childers Metals; ITW Insulation Systems; Metal Jacketing Systems.
    - b. RPR Products, Inc.; Insul-Mate.
  - 2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.
    - a. Sheet and roll stock ready for shop or field sizing or factory cut and rolled to size.
    - b. Finish and thickness are indicated in field-applied jacket schedules.
    - c. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper.
    - d. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper or 2.5-mil- thick Polysurlyn.



- e. Factory-Fabricated Fitting Covers:
  - 1) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
  - 2) Provide factory fabricated PVC tee covers, flange and union covers, beveled collars and valve covers.
  - 3) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- 3. Stainless-Steel Jacket: ASTM A 167 or ASTM A 240/A 240M.
  - a. Sheet and roll stock ready for shop or field sizing factory cut and rolled to size.
  - b. Material, finish, and thickness are indicated in field-applied jacket systems.
  - c. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper.
  - d. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper or 2.5-mil- thick Polysurlyn.
  - e. Factory-Fabricated Fitting Covers:
    - 1) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    - 2) Provide factory fabricated PVC tee covers, flange and union covers, beveled collars and valve covers.
    - 3) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- E. Self-Adhesive Outdoor Jacket: Laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with aluminum-foil facing.
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. MFM Building Products Corp.; FlexClad-400
    - b. Polyguard; Alumaguard.
    - c. Venture Tape Corp.; VentureClad.

## 2.14 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
    - b. Compac Corp.; 104 and 105.
    - c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
    - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
  - 2. Width: 3 inches.
  - 3. Thickness: 11.5 mils.
  - 4. Adhesion: 90 ounces force/inch in width.
  - 5. Elongation: 2 percent.
  - 6. Tensile Strength: 40 lbf/inch in width.
  - 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136 and UL listed.
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
    - b. Compac Corp.; 110 and 111.
    - c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
    - d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.
  - 2. Width: 3 inches.
  - 3. Thickness: 6.5 mils.
  - 4. Adhesion: 90 ounces force/inch in width.
  - 5. Elongation: 2 percent.
  - 6. Tensile Strength: 40 lbf/inch in width.
  - 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
    - b. Compac Corp.; 130.
    - c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
    - d. Venture Tape; 1506 CW NS.
  2. Width: 2 inches.
  3. Thickness: 6 mils.
  4. Adhesion: 64 ounces force/inch in width.
  5. Elongation: 500 percent.
  6. Tensile Strength: 18 lbf/inch in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive and UL listed.
1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
    - b. Compac Corp.; 120.
    - c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
    - d. Venture Tape; 3520 CW.
  2. Width: 2 inches.
  3. Thickness: 3.7 mils.
  4. Adhesion: 100 ounces force/inch in width.
  5. Elongation: 5 percent.
  6. Tensile Strength: 34 lbf/inch in width.

## 2.15 SECUREMENTS

- A. Bands:
1. Products: Subject to compliance with requirements, provide one of the products specified.
    - a. PABCO-Childers Metals; ITW Insulation Systems; Pab-Bands and Fabstraps.
    - b. RPR Products, Inc.; Bands.
  2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing or closed seal.
  3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.
  4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.
- B. Insulation Pins and Hangers:
1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
    - a. Products: Subject to compliance with requirements, provide one of the products specified.
      - 1) AGM Industries, Inc.; CWP-1.
      - 2) GEMCO; CD.
      - 3) Midwest Fasteners, Inc.; CD.
      - 4) Nelson Stud Welding; TPA, TPC, and TPS.
  2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
    - a. Products: Subject to compliance with requirements, provide one of the products specified.
      - 1) AGM Industries, Inc.; CWP-1.
      - 2) GEMCO; Cupped Head Weld Pin.
      - 3) Midwest Fasteners, Inc.; Cupped Head.
      - 4) Nelson Stud Welding; CHP.
  3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

- a. Products: Subject to compliance with requirements, provide one of the products specified.
    - 1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
    - 2) GEMCO; Perforated Base.
    - 3) Midwest Fasteners, Inc.; Spindle.
  - b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - c. Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
  - d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
  - a. Products: Subject to compliance with requirements, provide one of the products specified.
    - 1) GEMCO; Nylon Hangers.
    - 2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.
  - b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
  - c. Spindle: Nylon, 0.106-inch- diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
  - d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
  - a. Products: Subject to compliance with requirements, provide one of the products specified.
    - 1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series TSA.
    - 2) GEMCO; Press and Peel.
    - 3) Midwest Fasteners, Inc.; Self Stick.
  - b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - c. Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
  - d. Adhesive-backed base with a peel-off protective cover.
6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
  - a. Products: Subject to compliance with requirements, provide one of the products specified.
    - 1) AGM Industries, Inc.; RC-150.
    - 2) GEMCO; R-150.
    - 3) Midwest Fasteners, Inc.; WA-150.
    - 4) Nelson Stud Welding; Speed Clips.
  - b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
  - a. Manufacturers:
    - 1) GEMCO.
    - 2) Midwest Fasteners, Inc.
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

- D. Wire: 0.062-inch soft-annealed, stainless steel.
  - 1. Manufacturers:
    - a. ACS Industries, Inc.
    - b. C & F Wire.
    - c. PABCO-Childers Metals; ITW Insulation Systems.
    - d. RPR Products, Inc.

## **2.16 CORNER ANGLES**

- A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.
- B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.
- C. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or 316.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
  - 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
  - 2. Verify that surfaces to be insulated are clean and dry.
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### **3.03 COMMON INSTALLATION REQUIREMENTS**

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at the 4 o'clock or 8 o'clock position on horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive as recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
  - 1. Install insulation continuously through hangers and around anchor attachments.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install thermal hanger insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover thermal hanger inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
  1. Draw jacket tight and smooth.
  2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at the 4 o'clock or 8 o'clock position on the pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
    - a. For below ambient services, apply vapor-barrier mastic over staples.
  4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
  5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness. Where compression of insulation is possible, fabricate/install insulation per manufacturer's recommendations.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above ambient services, do not install insulation to the following:
  1. Vibration-control devices.
  2. Testing agency labels and stamps.
  3. Nameplates and data plates.
  4. Manholes.
  5. Handholes.
  6. Cleanouts.

### **3.04 PENETRATIONS**

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  1. Seal penetrations with flashing sealant.
  2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
  4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Below-Grade Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
  1. Seal penetrations with flashing sealant.
  2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations that Are Not Fire Rated: Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations:
  1. Terminate ductwork insulation at angle closure of fire damper sleeves.
  2. Install pipe insulation continuously through penetrations of fire-rated walls and partitions.
    - a. Firestopping is specified in Division 07 Section "Through-Penetration Firestop Systems."
- F. Insulation Installation at Floor Penetrations:
  1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at angle closure of fire damper sleeves.
  2. Pipe: Install insulation continuously through floor penetrations.
    - a. Seal penetrations through fire-rated assemblies according to Division 07 Section "Through-Penetration Firestop Systems."

### **3.05 GENERAL PIPE INSULATION INSTALLATION**

- A. Requirements in this Article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
  1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
  2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
  6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
  7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  8. For services not specified to receive a field-applied jacket except for flexible Elastomeric, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
  9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
  - 1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
  - 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
  - 3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
  - 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
  - 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### **3.06 FLEXIBLE ELASTOMERIC PIPE INSULATION INSTALLATION**

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
  - 1. Install pipe insulation to outer diameter of pipe flange.
  - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
  - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
  - 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
  - 1. Install mitered sections of pipe insulation.
  - 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
  - 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
  - 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  - 3. Install insulation to flanges as specified for flange insulation application.
  - 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

### **3.07 GLASS-FIBER PIPE INSULATION INSTALLATION**

- A. Insulation Installation on Straight Pipes and Tubes:
  - 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
  - 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
  1. Install PVC fitting covers when available.
  2. When PVC fitting covers are not available, install preformed pipe insulation to outer diameter of pipe flange:
    - a. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
    - b. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with fiberglass or mineral wool blanket insulation as specified for system.
  3. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
  1. Install PVC fitting covers when available.
  2. When PVC fitting covers are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
  1. Install PVC fitting covers when available.
  2. When PVC fitting covers are not available, install mitered sections of pipe insulation to valve body.
  3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  4. Install insulation to flanges as specified for flange insulation application.

### 3.08 DUCT AND PLENUM INSULATION INSTALLATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with insulation pins.
  1. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    - d. Do not over compress insulation during installation.
    - e. Impale insulation over pins and attach speed washers.
    - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
  2. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
    - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover



- insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
3. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
  4. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
  5. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
  2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
  3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    - d. Do not over compress insulation during installation.
    - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
  4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
    - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
  5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
  6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

### **3.09 EQUIPMENT, TANK, AND VESSEL INSULATION INSTALLATION**

- A. Secure insulation with adhesive and anchor pins and speed washers.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.
  2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
  3. Protect exposed corners with secured corner angles.

4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:
  - a. Do not weld anchor pins to ASME-labeled pressure vessels.
  - b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
  - c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
  - d. Do not over compress insulation during installation.
  - e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
  - f. Impale insulation over anchor pins and attach speed washers.
  - g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
7. Stagger joints between insulation layers at least 3 inches.
8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.
- B. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.
  1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
  2. Seal longitudinal seams and end joints.
- C. Insulation Installation on Pumps:
  1. Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box joints with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt flanges on 6-inch centers, starting at corners. Install 3/8-inch- diameter fasteners with wing nuts. Alternatively, secure the box sections together using a latching mechanism.
  2. Fabricate boxes from galvanized steel, at least 0.040 inch thick.
  3. For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable gasket material to form a vapor barrier.

### **3.10 FIELD-APPLIED JACKET INSTALLATION**

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
  1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

- C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

**3.11 FINISHES**

- A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system specified in Division 09 painting Sections.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

**END OF SECTION 20 0700**

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Provisions of Division 20 Section "Mechanical General Requirements" apply to this Section.
- C. Related Sections include the following:

1. Division 10 Section "Fire-Protection Specialties" for cabinets and fire extinguishers.
2. Division 20 Section "Basic Mechanical Materials and Methods."
3. Division 20 Section "Hangers and Supports."
4. Division 28 Section "Fire Alarm" for alarm devices not specified in this Section.
5. Division 33 Section "Water Distribution" for piping outside the building.

#### **1.02 SUMMARY**

- A. This Section includes water-based fire-suppression systems inside the building.

#### **1.03 DEFINITIONS**

- A. CR: Chlorosulfonated polyethylene synthetic rubber.
- B. PE: Polyethylene plastic.
- C. Underground Service-Entrance Piping: Underground service piping below the building.
- D. Hose Connection: Valve with threaded outlet matching fire hose coupling thread for attaching fire hose.
- E. Hose Station: Hose connection, fire hose rack, and fire hose.
- F. Working Plans: Documents, including drawings, calculations, and material specifications prepared according to NFPA 13 and NFPA 14 for obtaining approval from authorities having jurisdiction.

#### **1.04 SYSTEM DESCRIPTIONS**

- A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.
- B. Dry-Pipe Sprinkler System (Serves existing Curling Center): Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from opened sprinklers

#### **1.05 PERFORMANCE REQUIREMENTS**

- A. Standard Piping System Component Working Pressure: Listed for at least 175 psig.
- B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Fire-suppression sprinkler system design shall be approved by authorities having jurisdiction.
1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
  2. Sprinkler Occupancy Hazard Classifications, for bidding purposes, as follows:
    - a. Building Service Areas: Ordinary Hazard, Group 1.
    - b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
    - c. General Storage Areas: Ordinary Hazard, Group 1.
    - d. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
    - e. Office and Public Areas: Light Hazard.
  3. Minimum Density for Automatic-Sprinkler Piping Design:
    - a. Light-Hazard Occupancy: 0.10 gpm/sq. ft. over 1500-sq. ft. area.
    - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
    - c. Special Occupancy Hazard: As determined by authorities having jurisdiction.
  4. Maximum Protection Area per Sprinkler:
    - a. Office Spaces: 120 sq. ft.
    - b. Storage Areas: 130 sq. ft.
    - c. Mechanical Equipment Rooms: 130 sq. ft.
    - d. Electrical Equipment Rooms: 130 sq. ft.
    - e. Other Areas: According to NFPA 13 recommendations, unless otherwise indicated.
- D. Water velocity in the piping system shall not exceed the following:

1. Underground mains: 16 ft./sec.
2. Aboveground mains: 32 ft./sec.
3. Sprinkler branch lines: 24 ft./sec.

#### **1.06 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  1. Wiring Diagrams: For power, signal, and control wiring.
- C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  1. Domestic water piping.
  2. HVAC hydronic piping.
  3. Items penetrating finished ceiling include the following:
    - a. Lighting fixtures.
    - b. Air outlets and inlets.
- E. Qualification Data: For qualified Installer.
- F. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, and the Owner's insurance underwriter including hydraulic calculations, if applicable.
  1. Sprinklers shall be referred to on drawings, submittals, and other documentation, by the sprinkler identification number (SIN) or model number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations shall not be allowed.
- G. Welding certificates.
- H. Fire-hydrant flow test report.
- I. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- J. Field quality-control reports.
- K. Operation and Maintenance Data: For sprinkler specialties to include in operation and maintenance manuals.

#### **1.07 QUALITY ASSURANCE**

- A. Installer Qualifications:
  1. Installer's responsibilities include designing, fabricating, and installing fire-suppression systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
    - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.
- B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- C. The provisions and requirements of the NFPA and the Owner's insurance underwriter constitute mandatory minimum requirements for the work of this Section.
- D. NFPA Standards: Fire-suppression-system equipment, specialties, accessories, installation, and testing shall comply with the following:
  1. NFPA 13, "Installation of Sprinkler Systems."
  2. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."
  3. NFPA 230, "Fire Protection of Storage."

#### **1.08 COORDINATION**

- A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

**1.09 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Sprinkler Cabinets: Finished, wall-mounting, steel cabinet with hinged cover, with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler on Project.

**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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

**2.02 STANDARD-WEIGHT BLACK STEEL PIPE AND FITTINGS**

- A. Threaded-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, with factory- or field-formed threaded ends, and with factory applied antimicrobial coating on inner wall of pipe.
  - 1. Cast-Iron Threaded Flanges: ASME B16.1.
  - 2. Malleable-Iron Threaded Fittings: ASME B16.3.
  - 3. Gray-Iron Threaded Fittings: ASME B16.4.
  - 4. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe. Include ends matching joining method.
  - 5. Steel Threaded Couplings: ASTM A 865.
- B. Plain-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, and with factory applied antimicrobial coating on inner wall of pipe.
  - 1. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or ASME B16.11.
  - 2. Steel Flanges and Flanged Fittings: ASME B16.5.
- C. Grooved-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, with factory- or field-formed, square-cut- or roll- grooved ends, and with factory applied antimicrobial coating on inner wall of pipe.
  - 1. Grooved-Joint Piping Systems:
    - a. Manufacturers:
      - 1) Anvil International, Inc.; Model 7401.
      - 2) Tyco Fire & Building Products; Grinnell Mechanical Products; Model 577 or 772.
      - 3) Victaulic Co. of America; Style 005 or 009.
    - b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.
    - c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, rubber gasket listed for use with housing, and steel bolts and nuts.

**2.03 STANDARD-WEIGHT GALVANIZED STEEL PIPE AND FITTINGS**

- A. Threaded-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, hot-dip galvanized, with factory- or field-formed threaded ends.
  - 1. Cast-Iron Threaded Flanges: ASME B16.1, hot-dip galvanized.
  - 2. Malleable-Iron Threaded Fittings: ASME B16.3, hot-dip galvanized.
  - 3. Gray-Iron Threaded Fittings: ASME B16.4, hot-dip galvanized.
  - 4. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe, hot-dip galvanized. Include ends matching joining method.



5. Steel Threaded Couplings: ASTM A 865, hot-dip galvanized.
- B. Grooved-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, hot-dip galvanized with factory- or field-formed, square-cut-grooved ends.
  1. Grooved-Joint Piping Systems:
    - a. Manufacturers:
      - 1) Anvil International, Inc.; Model 7401.
      - 2) Tyco Fire & Building Products; Grinnell Mechanical Products; Model 577 or 772.
      - 3) Victaulic Co. of America; Style 005 or 009.
    - b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.
    - c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, rubber gasket listed for use with housing, and steel bolts and nuts.

## **2.04 SCHEDULE 10 BLACK STEEL PIPE AND FITTINGS**

- A. Plain-End, Schedule 10 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in NPS 5 and smaller; and NFPA 13 specified wall thickness in NPS 6 to NPS 10, and with factory applied antimicrobial coating on inner wall of pipe.
  1. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or ASME B16.11.
  2. Steel Flanges and Flanged Fittings: ASME B16.5.
- B. Grooved-End, Schedule 10 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in NPS 5 and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10; with factory- or field-formed, roll-grooved ends, and with factory applied antimicrobial coating on inner wall of pipe.
  1. Grooved-Joint Piping Systems:
    - a. Manufacturers:
      - 1) Anvil International, Inc.; Model 7401.
      - 2) Tyco Fire & Building Products; Grinnell Mechanical Products; Model 577 or 772.
      - 3) Victaulic Co. of America; Style 005 or 009.
    - b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.
    - c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, rubber gasket listed for use with housing, and steel bolts and nuts.

## **2.05 BACKFLOW PREVENTION DEVICES**

- A. Double-Check, Detector-Assembly Backflow Preventers:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Conbraco Industries, Inc.
    - b. FEBCO; a Division of Watts Water Technologies, Inc.
    - c. Watts Water Technologies, Inc.; Ames Fire & Waterworks.
    - d. Watts Water Technologies, Inc.; Watts Regulator Co.
    - e. Zurn Plumbing Products Group; Wilkins Div.
  2. Standard: ASSE 1048 and FMG approved or UL listed.
  3. Operation: Continuous-pressure applications.
  4. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
  5. Size and Capacity: As indicated on the drawings.
  6. Body: Cast-iron or ductile-iron, with interior lining complying with AWWA C550 or that is FDA approved.
  7. End Connections: Flanged.
  8. Configuration: Designed for horizontal, straight through flow.

9. Accessories:
  - a. Valves: Outside screw and yoke gate-type with flanged ends on inlet and outlet.
  - b. Bypass: With displacement-type water meter, shutoff valves, and double-check backflow prevention device.

## **2.06 SPRINKLER SPECIALTY FITTINGS**

- A. Sprinkler specialty fittings shall be UL listed or FMG approved, with 175-psig minimum working-pressure rating, and made of materials compatible with piping.
- B. Sprinkler Drain and Alarm Test Fittings: Cast- or ductile-iron body; with threaded or locking-lug inlet and outlet, test valve, and orifice and sight glass.
  1. Manufacturers:
    - a. Tyco Fire & Building Products LP.
    - b. Fire-End and Croker Corp.
    - c. Viking Corp.
    - d. Victaulic Co. of America.
- C. Sprinkler Branch-Line Test Fittings: Brass body with threaded inlet, capped drain outlet, and threaded outlet for sprinkler.
  1. Manufacturers:
    - a. Elkhart Brass Mfg. Co., Inc.
- D. Sprinkler Inspector's Test Fitting: Cast- or ductile-iron housing with threaded inlet and drain outlet and sight glass.
  1. Manufacturers:
    - a. AGF Manufacturing Co.
    - b. Tyco Fire & Building Products LP.
    - c. G/J Innovations, Inc.
    - d. Triple R Specialty of Ajax, Inc.

## **2.07 LISTED FIRE-PROTECTION VALVES**

- A. Valves shall be UL listed or FMG approved, with 175-psig minimum pressure rating.
- B. Ball Valves: Comply with UL 1091, except with ball instead of disc.
  1. NPS 1-1/2 and Smaller: Bronze body with threaded ends.
  2. NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
  3. NPS 3: Ductile-iron body with grooved ends.
  4. Manufacturers:
    - a. NIBCO.
    - b. Victaulic Co. of America.
- C. Butterfly Valves: UL 1091.
  1. NPS 2-1/2 and Larger: Bronze, cast-iron, or ductile-iron body; wafer type or with flanged or grooved ends.
    - a. Manufacturers:
      - 1) McWane, Inc.; Kennedy Valve Div.
      - 2) Mueller Company.
      - 3) NIBCO.
      - 4) Tyco Fire & Building Products.
      - 5) Victaulic Co. of America.
- D. Check Valves NPS 2 and Larger: UL 312, swing type, cast-iron body with flanged or grooved ends.
  1. Manufacturers:
    - a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Crane Co.; Crane Valve Group; Jenkins Valves.
    - c. Tyco Fire & Building Products.
    - d. Hammond Valve.
    - e. McWane, Inc.; Kennedy Valve Div.
    - f. Mueller Company.

- g. NIBCO.
  - h. Crane Co.; Crane Valve Group; Stockham Valves.
  - i. Victaulic Co. of America.
  - j. Watts Water Technologies, Inc.; Watts Regulator Co.
- E. Gate Valves: UL 262, OS&Y type.
  - 1. NPS 2 and Smaller: Bronze body with threaded ends.
    - a. Manufacturers:
      - 1) Crane Co.; Crane Valve Group; Crane Valves.
      - 2) Hammond Valve.
      - 3) NIBCO.
  - 2. NPS 2-1/2 and Larger: Cast-iron body with flanged ends.
    - a. Manufacturers:
      - 1) McWane, Inc.; Clow Valve Co.
      - 2) Crane Co.; Crane Valve Group; Crane Valves.
      - 3) Crane Co.; Crane Valve Group; Jenkins Valves.
      - 4) Hammond Valve.
      - 5) Milwaukee Valve Company.
      - 6) Mueller Company.
      - 7) NIBCO.

## **2.08 UNLISTED GENERAL-DUTY VALVES**

- A. Ball Valves NPS 2 and Smaller: MSS SP-110, 2-piece copper-alloy body with chrome-plated brass ball, 600-psig minimum CWP rating, blowout-proof stem, and threaded ends.
- B. Check Valves NPS 2 and Smaller: MSS SP-80, Type 4, Class 125 minimum, swing type with bronze body, nonmetallic disc, and threaded ends.
- C. Gate Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, solid wedge, and threaded ends.
- D. Globe Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, nonmetallic disc, and threaded ends.

## **2.09 ALARM CHECK VALVES**

- A. General Requirements:
  - 1. Standard: UL listed or FMG approved.
  - 2. Pressure Rating:
    - a. Standard-Pressure Valves: 175 psig minimum.
  - 3. Body Material: Cast or ductile iron.
  - 4. Size: Same as connected piping.
  - 5. End Connections: Flanged or grooved.
- B. Manufacturers:
  - 1. Reliable Automatic Sprinkler Co., Inc.
  - 2. Tyco Fire & Building Products.
  - 3. Viking Corp.
  - 4. Victaulic Co. of America.
- C. Description: UL 193, designed for horizontal or vertical installation, with bronze grooved seat with O-ring seals, single-hinge pin, and latch design. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.
  - 1. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.

## **2.10 DRY PIPE VALVES**

- A. General Requirements:
  - 1. Standard: UL listed or FMG approved.
  - 2. Pressure Rating:
    - a. Standard-Pressure Valves: 175 psig minimum.
    - b. High-Pressure Valves: 300 psig.

3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.
- B. Manufacturers:
  1. Reliable Automatic Sprinkler Co., Inc.
  2. Tyco Fire Protection Products by Johnson Controls Company.
  3. Viking Corp.
  4. Victaulic Co. of America; Series 768 Firelock NXT.
- C. Description: UL 260, differential type; with bronze seat with O-ring seals, single-hinge pin, and latch design. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
  1. Air-Pressure Maintenance Device: UL 260, automatic device to maintain correct air pressure in piping. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig maximum inlet pressure.
    - a. Manufacturers:
      - 1) Reliable Automatic Sprinkler Co., Inc.
      - 2) Tyco Fire Protection Products by Johnson Controls Company.
      - 3) Viking Corp.
      - 4) Victaulic Co. of America.
  2. Air Compressor: UL 753, fractional horsepower, 120-V ac, 60 Hz, single phase.

## **2.11 AUTOMATIC (BALL DRIP) DRAIN VALVES**

- A. General:
  1. Standard: UL 1726.
  2. Pressure Rating: 175 psig minimum.
  3. Type: Automatic draining, ball check.
  4. Size: NPS 3/4.
  5. End Connections: Threaded.
- B. Manufacturer:
  1. Reliable Automatic Sprinkler Co., Inc.
  2. Tyco Fire & Building Products.

## **2.12 SPRINKLERS**

- A. Sprinklers shall be UL listed or FMG approved, with 175-psig minimum pressure rating.
- B. Manufacturers:
  1. Reliable Automatic Sprinkler Co., Inc.
  2. Tyco Fire & Building Products.
  3. Victaulic Co. of America.
  4. Viking Corp.
- C. Automatic Sprinklers:
  1. With heat-responsive glass bulb element complying with the following:
    - a. UL 199, for nonresidential applications.
    - b. UL 1767, for early-suppression, fast-response applications.
- D. Sprinkler Types and Categories: Nominal 1/2-inch orifice for 165 deg F "Ordinary" temperature classification rating, unless otherwise indicated or required by application.
- E. Sprinkler types, features, and options as follows:
  1. Concealed ceiling sprinklers, including cover plate.
  2. Flush ceiling sprinklers, including escutcheon.
  3. Pendent sprinklers.
  4. Quick-response sprinklers.
  5. Recessed sprinklers, including escutcheon.
  6. Upright sprinklers.

- F. Sprinkler Finishes: Chrome plated, bronze, and painted.
- G. Special Coatings: Wax, lead, and corrosion-resistant paint.
- H. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers. Escutcheons listed, supplied, and approved for use with the sprinkler by the sprinkler manufacturer.
  - 1. Ceiling Mounting: Chrome-plated steel, 2 piece, with 3/4-inch vertical adjustment.
  - 2. Sidewall Mounting: Chrome-plated steel, one piece, flat.
- I. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler. Sprinkler guards listed, supplied, and approved for use with the sprinkler by the sprinkler manufacturer.

## **2.13 FIRE DEPARTMENT CONNECTIONS**

- A. Manufacturers:
  - 1. Elkhart Brass Mfg. Co., Inc.
  - 2. Potter-Roemer; Fire-Protection Div.
- B. Wall-Type, Fire Department Connection: UL 405, 175-psig minimum pressure rating; with corrosion-resistant-metal body with brass inlets, brass wall escutcheon plate, brass lugged caps with gaskets and brass chains, and brass lugged swivel connections. Include inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, outlet with pipe threads, extension pipe nipples, check devices or clappers for inlets, and escutcheon plate with marking similar to "AUTO SPKR & STANDPIPE."
  - 1. Type: Exposed, projecting, with two inlets and round escutcheon plate.
  - 2. Finish: Rough chrome-plated.

## **2.14 ALARM DEVICES**

- A. Alarm-device types shall match piping and equipment connections.
- B. Water-Flow Indicator: UL 346, electrical-supervision, paddle-operated-type, water-flow detector with 250-psig pressure rating and designed for horizontal or vertical installation. Include two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
  - 1. Manufacturers:
    - a. Potter Electric Signal Company.
    - b. System Sensor.
- C. Pressure Switch: UL 753, electrical-supervision-type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.
  - 1. Manufacturers:
    - a. Potter Electric Signal Company.
    - b. System Sensor.
- D. Valve Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled valve is in other than fully open position.
  - 1. Manufacturers:
    - a. Potter Electric Signal Company.
    - b. System Sensor.
- E. Indicator-Post Supervisory Switch: UL 753, electrical, single-pole, double-throw switch with normally closed contacts. Include design that signals controlled indicator-post valve is in other than fully open position.
  - 1. Manufacturers:
    - a. Potter Electric Signal Company.
    - b. System Sensor.

## 2.15 PRESSURE GAGES

- A. Manufacturers:
  - 1. AMETEK, Inc.; U.S. Gauge.
  - 2. Ashcroft Inc.
  - 3. Marsh Bellofram.
  - 4. Viking Corp.
  - 5. Weiss Instruments, Inc.
- B. Description: UL 393, 3-1/2- to 4-1/2-inch- diameter, dial pressure gage with range of 0 to 250 psig minimum.
  - 1. Water System Piping: Include caption "WATER" or "AIR/WATER" on dial face.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in Part 1 "Quality Assurance" Article.
- B. Report test results promptly and in writing.

### 3.02 EXAMINATION

- A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.
- B. Examine walls and partitions for suitable thicknesses, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.03 PIPING APPLICATIONS, GENERAL

- A. Flanges, flanged fittings, unions, nipples, grooved-joint couplings, and transition and special fittings with finish and pressure ratings same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.
- B. Piping between Fire Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends, cast- or malleable-iron threaded fittings, and threaded joints; or with grooved ends, grooved-end fittings, grooved-end-pipe couplings, and grooved joints.

### 3.04 SPRINKLER RISER SYSTEM PIPING APPLICATIONS

- A. Sprinkler Risers and Standpipes: Use the following:

<u>Pipe Type</u>	<u>4" &amp; Smaller</u>	<u>5" &amp; 6"</u>	<u>8" - 12"</u>
Standard weight steel, threaded fittings	YES	YES	NO
Standard weight steel, grooved fittings	YES	YES	YES
Standard weight steel, welded fittings	YES	YES	YES
Galv. standard weight steel, threaded fittings	YES	YES	NO
Galv. standard weight steel, grooved fittings	YES	YES	YES

### 3.05 SPRINKLER SYSTEM PIPING APPLICATIONS

#### A. Wet-Pipe Sprinklers: Use the following:

Pipe Type	1 ½" & Smaller	2"	2 ½" – 3 ½"	4"	5" – 6"
Standard weight steel, threaded fittings	YES	YES	YES	YES	NO
Standard weight steel, grooved fittings	NO	NO	YES	YES	YES
Standard weight steel, welded fittings	NO	YES	YES	YES	YES
Galv. standard weight steel, threaded fittings	YES	YES	YES	YES	YES
Galv. standard weight steel, grooved fittings	NO	NO	YES	YES	YES
Schedule 10 steel, welded fittings	NO	YES	YES	YES	YES
Schedule 10 steel, grooved fittings	NO	NO	YES	YES	YES

### 3.06 VALVE APPLICATIONS

#### A. The following requirements apply:

1. Listed Fire-Protection Valves: UL listed or FMG approved for applications where required by NFPA 13.
  - a. Shutoff Duty: Use ball, butterfly, or gate valves.
2. Unlisted General-Duty Valves: For applications where UL-listed and FMG-approved valves are not required by NFPA 13.
  - a. Shutoff Duty: Use ball, butterfly, or gate valves.
  - b. Throttling Duty: Use ball or globe valves.

### 3.07 JOINT CONSTRUCTION

- A. Refer to Division 20 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Threaded Joints: Comply with NFPA 13 for pipe thickness and threads. Do not thread pipe smaller than NPS 8 with wall thickness less than Schedule 40 unless approved by authorities having jurisdiction and threads are checked by a ring gage and comply with ASME B1.20.1.
- C. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
  1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- D. Use of saddle style tees is not acceptable.
- E. Grooved Joints: Assemble joints with listed coupling and gasket, lubricant, and bolts.
  1. All grooved couplings, fittings, gaskets, valves, and specialties shall be the product of a single manufacturer.
  2. Steel Pipe: Square-cut or roll-groove piping as indicated. Use grooved-end fittings and rigid, grooved-end-pipe couplings, unless otherwise indicated.

### 3.08 WATER-SUPPLY CONNECTION

- A. Connect fire-suppression piping to building's interior water distribution piping.
- B. Install shutoff valve, double-check, detector-assembly backflow preventor, pressure gage, drain, and other accessories indicated at connection to water distribution piping.

### 3.09 PIPING INSTALLATION

- A. Refer to Division 20 Section "Basic Mechanical Materials and Methods" for basic piping installation.

- B. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- C. Install unions adjacent to each valve in pipes NPS 2 and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.
- D. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 and larger connections.
- E. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, sized and located according to NFPA 13.
- F. Install sprinkler piping with drains for complete system drainage.
- G. Install sprinkler zone control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- H. Install drain valves on standpipes.
- I. Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building.
- J. Install alarm devices in piping systems.
- K. Hangers and Supports: Comply with NFPA 13 for hanger materials.
  - 1. Install standpipe system piping according to NFPA 14.
  - 2. Install sprinkler system piping according to NFPA 13, except use of "C" clamps, or beam clamps of "C" pattern, or any modification thereof, is prohibited for supporting pipes larger than NPS 2-1/2.
  - 3. Refer to Division 20 Section "Hangers and Supports" for additional requirements.
- L. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
- M. Fill wet-pipe sprinkler system piping with water.

### **3.10 VALVE INSTALLATION**

- A. Install listed fire-protection valves, unlisted general-duty valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Specialty Valves:
  - 1. Alarm Check Valves: Install in vertical position for proper direction of flow, including bypass check valve and retarding chamber drain-line connection.

### **3.11 SPRINKLER APPLICATIONS**

- A. Use the following sprinkler types:
  - 1. Rooms without Ceilings: Upright sprinklers.
  - 2. Rooms with Suspended Ceilings: Concealed sprinklers.
  - 3. Wall Mounting: Sidewall sprinklers.
  - 4. Sprinkler Finishes:
    - a. Upright, Pendent, and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes; white polyester finish in natatoriums.
    - b. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
    - c. Flush Sprinklers: Bright chrome, with painted white escutcheon.
    - d. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
  - 5. Sprinkler Guards: For exposed sprinkler heads subject to damage.

### **3.12 SPRINKLER INSTALLATION**

- A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels and tiles.



**3.13 FIRE DEPARTMENT CONNECTION INSTALLATION**

- A. Install wall-type, fire department connections in vertical wall.
- B. Install ball drip valve at each check valve for fire department connection.

**3.14 CONNECTIONS**

- A. Install piping adjacent to equipment to allow service and maintenance.
- B. Connect water-supply piping to fire-suppression piping. Include backflow preventer between potable-water piping and fire-suppression piping. Refer to Division 22 Section "Domestic Water Piping Specialties" for backflow preventers.
- C. Install ball drip valves at each check valve for fire department connection. Drain to floor drain or outside building.
- D. Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.
- E. Connect compressed-air supply to dry-pipe sprinkler piping.
- F. Connect air compressor to the following piping and wiring:
  - 1. Pressure gages and controls.
  - 2. Electrical power system.
  - 3. Fire alarm devices, including low-pressure alarm.
- G. Electrical Connections: Power wiring and fire alarm wiring are specified in Division 26.
- H. Connect alarm devices to fire alarm.
- I. Ground equipment according to Division 26 Section "Grounding and Bonding."
- J. Connect wiring according to Division 26 Section "Conductors and Cables."
- K. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

**3.15 LABELING AND IDENTIFICATION**

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and in Division 20 Section "Mechanical Identification."

**3.16 FIELD QUALITY CONTROL**

- A. Perform the following field tests and inspections and prepare test reports:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
  - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
  - 4. Verify that equipment hose threads are same as local fire department equipment.
  - 5. Test each double-check, detector-assembly backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Verify that specialty valves, trim, fittings, controls, and accessories are installed and operate correctly.
- C. Verify that specified tests of piping are complete.
- D. Verify that damaged sprinklers and sprinklers with paint or coating not specified are replaced with new, correct type.
- E. Verify that sprinklers are correct types, have correct finishes and temperature ratings, and have guards as required for each application.
- F. Verify that potable-water supplies have correct types of backflow preventers.
- G. Verify that air compressors and their accessories are installed and operate correctly.
- H. Start and run air compressors.

- I. Pressurize and check dry-pipe sprinkler piping air-pressure maintenance devices and air compressors.
- J. Energize circuits to electrical equipment and devices.
- K. Adjust operating controls and pressure settings.
- L. Coordinate with fire alarm tests. Operate as required.
- M. Report test results promptly and in writing to Architect and authorities having jurisdiction.

**3.17 CLEANING AND PROTECTION**

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers with paint other than factory finish.
- C. Protect sprinklers from damage until Substantial Completion.

**3.18 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

**END OF SECTION 21 1100**

## SECTION 22 0523 - GENERAL-DUTY VALVES FOR PLUMBING

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  1. Division 20 Section "Mechanical Identification" for valve tags and charts.
  2. Division 21 Fire-Suppression Piping and Fire Pump Sections for fire-protection valves.
  3. Division 22 Piping Sections for specialty valves applicable to those Sections only.
  4. Division 23 Section "General-Duty Valves for HVAC" for HVAC.
  5. Division 23 Section "Temperature Controls" for control valves and actuators.

#### 1.02 SUMMARY

- A. This Section includes valves for general plumbing applications. Refer to piping Sections for specialty valve applications.

#### 1.03 DEFINITIONS

- A. The following are standard abbreviations for valves:
  1. CWP: Cold working pressure.
  2. EPDM: Ethylene-propylene-diene terpolymer rubber.
  3. NBR: Acrylonitrile-butadiene rubber.
  4. NRS: Nonrising stem.
  5. OS&Y: Outside screw and yoke.
  6. PTFE: Polytetrafluoroethylene plastic.
  7. RPTFE: Reinforced polytetrafluoroethylene plastic.
  8. SWP: Steam working pressure.
  9. TFE: Tetrafluoroethylene plastic.
  10. WOG: Water, oil, and gas.

**1.04 ACTION SUBMITTALS**

- A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
  - 1. Certification that products for use in potable water systems comply with NSF 61 and NSF 372.

**1.05 QUALITY ASSURANCE**

- A. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.
- B. Regulatory Requirements: Comply with requirements in Public Law 111-380, "Reduction of Lead in Drinking Water Act," about lead content in materials that will be in contact with potable water for human consumption.
- C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set angle, gate, and globe valves closed to prevent rattling.
  - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
  - 5. Set butterfly valves closed or slightly open.
  - 6. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

**PART 2 - PRODUCTS**

**2.01 VALVES, GENERAL**

- A. Isolation valves are scheduled on the Drawings. For other general plumbing valve applications, use the following:
  - 1. Shutoff Service: Ball, butterfly valves.
  - 2. Throttling Service: Angle, ball, butterfly, or globe valves.
  - 3. Pump Discharge: Spring-loaded, lift-disc check valves; and bronze lift check valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- D. For valves not indicated in the Application Schedules, select valves with the following end connections:
  - 1. For Copper Tubing, NPS 2 and Smaller: Solder-joint or threaded ends, except provide valves with threaded ends for condenser water, heating hot water, steam, and steam condensate services.
  - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged, solder-joint, or threaded ends.
  - 3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
  - 4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
  - 5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends.
  - 6. For Steel Piping, NPS 5 and Larger: Flanged ends.
  - 7. For Grooved-End Systems: Valve ends may be grooved.

- E. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted unless otherwise noted.
- F. Wetted surfaces of valves contacted by consumable water shall contain not more than 0.25 percent weighted average lead content.
  - 1. Exceptions:
    - a. Valves in pumped sanitary systems.
    - b. Valves in pumped storm systems.
    - c. Drain valves.
    - d. Valves in general air or vacuum systems.
    - e. Valves in irrigation systems.
    - f. Valves in non-potable water systems.
    - g. Valves in other plumbing systems not intended for human consumption.
- G. Valve Sizes: Same as upstream pipe, unless otherwise indicated.
- H. Valve Actuators:
  - 1. Chainwheel: For attachment to valves, of size and mounting height, as indicated in the "Valve Installation" Article in Part 3.
  - 2. Gear Drive Operator: For quarter-turn valves NPS 8 and larger.
  - 3. Handwheel: For valves other than quarter-turn types.
  - 4. Lever Handle: For quarter-turn valves NPS 6 and smaller.
- I. Extended Valve Stems: On insulated valves.
- J. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.
- K. Valve Grooved Ends: AWWA C606.
- L. Solder Joint: With sockets according to ASME B16.18.
  - 1. Caution: Disassemble valves when soldering, as recommended by the manufacturer, to prevent damage to internal parts.
- M. Threaded: With threads according to ASME B1.20.1.
- N. Valve Bypass and Drain Connections: MSS SP-45.

## **2.02 BRONZE BALL VALVES**

- A. Bronze Ball Valves, General: MSS SP-110 and have bronze body complying with ASTM B 584, except for Class 250 which shall comply with ASTM B 61, full-depth ASME B1.20.1 threaded or solder ends, and blowout-proof stems.
- B. Two-Piece, Regular Port Bronze Ball Valves with Stainless-Steel Trim: Type 316 stainless-steel ball and stem, reinforced TFE seats, blow-out-proof stem, with adjustable stem packing, soldered or threaded ends; and 150 psig SWP and 600-psig CWP ratings.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Apollo Valves; by Conbraco Industries, Inc.; Series 70LF-140/240.
    - b. Hammond Valve.
    - c. Kitz Corporation; Kitz Valves.
    - d. Milwaukee Valve Company; Model UPBA100S/150S.
    - e. NIBCO INC.; Models S-580-70-66-LF/T-580-70-66-LF.
    - f. Watts Water Technologies, Inc.
- C. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim: Type 316 stainless-steel ball and stem, reinforced TFE seats, blow-out-proof stem, with adjustable stem packing, soldered or threaded ends; 150 psig SWP and 600-psig CWP ratings.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Apollo Valves; by Conbraco Industries, Inc.; Series 77CLF-A Series.
    - b. Hammond Valve.
    - c. Kitz Corporation; Kitz Valves.
    - d. Milwaukee Valve Company; UPBA400S/450S.
    - e. NIBCO INC.; Models S-585-70-66-LF/T-585-70-66-LF.
    - f. Watts Water Technologies, Inc.; Series LFB6080G2/LFB6081G2.

## **2.03 GENERAL SERVICE BUTTERFLY VALVES**

- A. General: MSS SP-67, for bubble-tight shutoff, extended-neck for insulation, disc and lining suitable for potable water, unless otherwise indicated, and with the following features:
  - 1. Full lug, and grooved valves shall be suitable for bi-directional dead end service at full rated pressure without the use or need of a downstream flange.
  - 2. Valve sizes NPS 2 through NPS 6 shall have lever lock operator; valve sizes NPS 8 and larger shall have weatherproof gear operator.
- B. Lug-Style (Single-Flange) Size NPS 2-1/2 through NPS 12, 200-psig CWP Rating, Aluminum-Bronze Disc, EPDM Seat, Ferrous-Alloy Butterfly Valves: Full-lug type with ductile-iron body, Type 416 stainless-steel stem, copper bushing, aluminum-bronze disc, and molded-in EPDM seat (liner).
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Apollo Valves; by Conbraco Industries, Inc.; Series 143 and Series LD145.
    - b. Bray International, Inc.
    - c. DeZurik.
    - d. Emerson Automation Solutions; Keystone.
    - e. Forum Energy Technologies; ABZ Valve.
    - f. Hammond Valve.
    - g. Milwaukee Valve Company.
    - h. NIBCO INC.; LD-2000-3/5.
    - i. Tyco Flow Control; Grinnell Flow Control.
    - j. Watts Water Technologies.
- C. Lug-Style (Single-Flange) Size NPS 14 and Larger, 150-psig CWP Rating, Aluminum-Bronze Disc, EPDM Seat, Ferrous-Alloy Butterfly Valves: Full-lug type with ductile-iron body, one- or two-piece Type 416 stainless-steel stem, bronze bushing, and phenolic-backed EPDM seat (liner) attached to the body.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Apollo Valves; by Conbraco Industries, Inc.; Series 143 and Series LD145.
    - b. Bray International, Inc.
    - c. DeZurik.
    - d. Emerson Automation Solutions; Keystone.
    - e. Forum Energy Technologies; ABZ Valve.
    - f. Milwaukee Valve Company.
    - g. NIBCO INC.; LD-1000-5.
    - h. Tyco Flow Control; Grinnell Flow Control.
    - i. Watts Water Technologies.
- D. Grooved-End Butterfly Valves with EPDM-Encapsulated Ductile-Iron Disc: Ductile-iron body with grooved or shouldered ends and polyamide coating inside and outside; Type 416 stainless-steel stem, PTFE bronze sintered on steel bushing, and 300-psig CWP Rating for Valves NPS 2 through NPS 8, 200 psig CWP Rating for Valves NPS 10 through NPS 12.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ASC Engineered Products.
    - b. NIBCO INC.; Model GD-4765-3/5.
    - c. Victaulic Co. of America.

## **2.04 BRONZE CHECK VALVES**

- A. Bronze Check Valves, General: MSS SP-80.
- B. Class 125, Bronze, Swing Check Valves with Bronze Disc: ASTM B-62 bronze body and seat with regrinding-type bronze disc, Y-pattern design, soldered or threaded end connections, and having 200 psig CWP rating.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Apollo Valves; by Conbraco Industries, Inc.; Model 162T-LF and 163T-LF (61YLF Series).
  - b. Milwaukee Valve Company; Model UP509/UP1509.
  - c. NIBCO INC.; Models S-413-B-LF or T-413-B-LF.
  - d. Watts Water Technologies; LFCVY/LFCVYS.

## **2.05 BRONZE GLOBE VALVES**

- A. Bronze Globe Valves, General: MSS SP-80, with malleable-iron handwheel.
- B. Class 125, TFE Disc, Bronze Globe Valves: ASTM B-62 bronze body, bonnet, and seat, TFE disc, copper-silicone bronze stem, union-ring bonnet, soldered or threaded end connections; and having 200 psig CWP rating.
  1. Manufacturers: Subject to compliance with requirements, Provide products by one of the following:
    - a. Apollo Valves; by Conbraco Industries, Inc.; Model 121T-LF.
    - b. Hammond Valve; UP418 and UP440.
    - c. Milwaukee Valve Company; Model UP502 and UP1502.
    - d. Watts Water Technologies, Inc.; LFGLV.

## **2.06 DRAIN VALVES**

- A. Ball-Valve-Type, Hose-End Drain Valves:
  1. Bronze ball valve as specified in this Section. Lead free construction is not required.
  2. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

## **2.07 SOURCE QUALITY CONTROL**

- A. Identification: Factory label or color coding to identify lead free valves.

# **PART 3 - EXECUTION**

## **3.01 EXAMINATION**

- A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.
  1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- D. Examine threads on valve and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- F. Do not attempt to repair defective valves; replace with new valves.

## **3.02 VALVE INSTALLATION**

- A. Piping installation requirements are specified in other Division 20 and 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe. Butterfly valves shall be installed with stem horizontal to allow support for the disc and the cleaning action of the disc.
- E. Install valves in position to allow full stem movement.
- F. Install chainwheel operators on valves NPS 4 and larger and more than 84 inches above floor. Extend chains to 60 inches above finished floor elevation.
- G. Install check valves for proper direction of flow and as follows:
  - 1. Swing Check Valves: In horizontal position with hinge pin level.
  - 2. Lift Check Valves: With stem upright and plumb.

**3.03 JOINT CONSTRUCTION**

- A. Refer to Division 20 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

**3.04 ADJUSTING**

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

**END OF SECTION 22 0523**



## SECTION 22 1116 - DOMESTIC WATER PIPING

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  1. Division 20 Section "Mechanical General Requirements."
  2. Division 20 Section "Basic Mechanical Materials and Methods" for materials and methods common to mechanical piping systems.
  3. Division 20 Section "Hangers and Supports."
  4. Division 20 Section "Meters and Gages" for thermometers, pressure gages, and fittings.
  5. Division 22 Section "General-Duty Valves for Plumbing."
  6. Division 22 Section "Domestic Water Piping Specialties" for water distribution piping specialties.

#### 1.02 SUMMARY

- A. This Section includes domestic water piping inside the building.
- B. DEFINITIONS
- C. PEX: Crosslinked polyethylene plastic.

#### 1.03 PERFORMANCE REQUIREMENTS

- A. Where not indicated on the Drawings, provide components and installation capable of producing domestic water piping systems with 125 psig, unless otherwise indicated.
  1. Exception: PEX plastic piping insert fittings specified are limited to 100 psig.

**1.04 SYSTEMS DESCRIPTION**

- A. Potable and non-potable domestic water piping system materials are scheduled on the Drawing.
- B. Refer to Application Schedules on the Drawings for valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Hot-Water-Piping, Balancing Duty: Calibrated balancing valves.
  - 2. Drain Duty: Hose-end drain valves.
  - 3. Isolation Valves at Domestic Water Meters: Gate Valves, NPS 2 and Smaller: Class 150, bronze.
  - 4. Isolation Valves at Domestic Water Meters: Gate Valves, NPS 2-1/2 and Larger: Class 125, OS&Y, bronze-mounted cast iron.
- C. Transition and special fittings with pressure ratings at least equal to piping rating may be used unless otherwise indicated.

**1.05 ACTION SUBMITTALS**

- A. Product Data: For pipe, tube, fittings, and couplings.

**1.06 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: For piping in equipment rooms and other congested areas, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
  - 1. Fire-suppression-water piping.
  - 2. Domestic water piping.
  - 3. Compressed air piping.

**1.07 CLOSEOUT SUBMITTALS**

- A. Field quality-control test reports.
- B. Water Samples: Specified in Part 3 "Cleaning" Article.

**1.08 QUALITY ASSURANCE**

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Regulatory Requirements: Comply with requirements in Public Law 111-380, "Reduction of Lead in Drinking Water Act," about lead content in materials that will be in contact with potable water for human consumption.
- C. Comply with NSF 14, "Plastics Piping System Components and Related Materials," for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.
- D. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," and NSF 372 Drinking Water System Components – Lead Content for potable domestic water piping and components.
- E. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be as recommended by the manufacturer of the grooved components.

**1.09 PROJECT CONDITIONS**

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
  - 1. Notify Owner no fewer than two days in advance of proposed interruption of water service.
  - 2. Do not proceed with interruption of water service without Owner's written permission.

**1.10 COORDINATION**

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

## **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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### **2.02 PIPING MATERIALS**

- A. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

### **2.03 COPPER TUBE AND FITTINGS**

- A. Soft Copper Tube: ASTM B 88, Type K, water tube, annealed temper.
1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
  2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
  3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- B. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.
1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
  2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
  3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- C. Grooved-Joint Systems:
1. Manufacturers:
    - a. ASC Engineered Solutions; Gruvlok; Fig. 64 CTS SlideLOK.
    - b. Victaulic Company; Style 606 and Style 607.
  2. Grooved-End-Tube Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.
  3. Copper, Grooved-End Fittings: ASTM B 75 copper tube or ASTM B 584 bronze castings.
- D. Copper or Bronze Pressure-Seal Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Viega North America; ProPress System.
    - b. NIBCO Inc.; Press System.
    - c. Mueller Industries, Inc.; Streamline PRS.
    - d. Elkhart Products Corporation; an Aalberts Industries Company; Xpress.
    - e. Apollo Valves; by Conbraco Industries; ApolloXpress.
    - f. ASC Engineered Solutions; Anvil Press.
  2. Housing: Copper.
  3. O-Rings and Pipe Stops: EPDM.
  4. Tools: Manufacturer's special tools.
  5. Maximum 200-psig working-pressure rating at 250 deg F.
- E. Copper, Mechanically Formed Tee Option: For forming T-branch on copper water tube. Mechanically formed tee fittings may be used up to half size of main.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. T-DRILL Industries Inc.

#### **2.04 PEX PIPE AND FITTINGS**

- A. PEX Distribution System: ASTM F 876 and ASTM F 877, SDR 9 tubing.
  - 1. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper crimp rings and matching PEX tube dimensions; or plastic-insert type cold expansion fittings and corresponding rings, material meeting requirements of ASTM F 1960.
  - 2. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 877 and with plastic or corrosion-resistant-metal valve for each outlet.

#### **2.05 VALVES**

- A. General-duty plumbing valves; and drain valves are specified in Division 22 Section "Plumbing Valves."
- B. Balancing valves are specified in Division 22 Section "Domestic Water Piping Specialties."

#### **2.06 SPECIALTY VALVES**

- A. Bronze Gate Valves: MSS SP-80, with malleable-iron handwheel.
  - 1. Class 150, Rising-Stem, Bronze Gate Valves: ASTM B-62 bronze body, bonnet, and wedge, copper-silicone bronze stem, screw-in bonnet, threaded end connections; and having 300 psig CWP rating.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Crane Valve Group; Crane Valves.
      - 2) Hammond Valve.
      - 3) Milwaukee Valve Company; Model 1150.
      - 4) NIBCO INC.; Models T-131, S-134 or T-134.
      - 5) Watts Water Technologies, Inc.; Series B-3110.

### **PART 3 - EXECUTION**

#### **3.01 EXCAVATION**

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earthwork."

#### **3.02 PIPING SYSTEM INSTALLATION**

- A. Basic piping installation requirements are specified in Division 20 Section "Basic Mechanical Materials and Methods."
- B. Install under-building-slab copper tubing according to Copper Development Association's "Copper Tube Handbook." Joints under slab are not allowed. Install PVC sleeve where piping penetrates slab.
- C. Install sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 20 Section "Basic Mechanical Materials and Methods."
- D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Division 20 Section "Basic Mechanical Materials and Methods."
- E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Pressure gages are specified in Division 20 Section "Meters and Gages," and strainers are specified in Division 22 Section "Domestic Water Piping Specialties."
- F. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops.
- G. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
  - 1. Install hose-end drain valves at low points in water mains, risers, and branches.
  - 2. Install stop-and-waste drain valves where indicated.

- H. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Calibrated balancing valves are specified in Division 22 Section "Domestic Water Piping Specialties."
- I. Install water-pressure regulators downstream from shutoff valves. Water-pressure regulators are specified in Division 22 Section "Domestic Water Piping Specialties."
- J. Install domestic water piping level without pitch and plumb.

### **3.03 JOINT CONSTRUCTION**

- A. Basic piping joint construction requirements are specified in Division 20 Section "Basic Mechanical Materials and Methods."

### **3.04 HANGER AND SUPPORT INSTALLATION**

- A. Pipe hanger and support devices are specified in Division 20 Section "Hangers and Supports." Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer than 100 Feet: MSS Type 49, spring cushion rolls, if indicated.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 20 Section "Hangers and Supports."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.
- E. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
  - 2. NPS 1-1/2: 108 inches with 3/8-inch rod.
  - 3. NPS 2: 10 feet with 3/8-inch rod.
  - 4. NPS 2-1/2: 11 feet with 1/2-inch rod.
  - 5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.
  - 6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
  - 7. NPS 6: 12 feet with 3/4-inch rod.
  - 8. NPS 8 to NPS 12: 12 feet with 7/8-inch rod.
- F. Install supports for vertical steel piping every 15 feet.
- G. Install hangers for drawn-temper copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 3/4 and Smaller: 60-inches with 3/8-inch rod.
  - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
  - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
  - 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
  - 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
  - 6. NPS 6: 10 feet with 5/8-inch rod.
  - 7. NPS 8: 10 feet with 3/4-inch rod.
- H. Install supports for vertical copper tubing every 10 feet.
- I. Soft copper tube: Continuous support using v-shaped plastic pipe channel, maximum hanger spacing 8 feet with 3/8-inch rod.
- J. Alternate support for copper tubing NPS 3/4 and smaller: Continuous support using v-shaped plastic pipe channel, maximum hanger spacing 8 feet with 3/8-inch rod.
- K. Install hangers for Schedule 10 stainless steel piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 2: 84 inches with 3/8-inch rod.
  - 2. NPS 2-1/2: 84 inches with 1/2-inch rod.

3. NPS 3: 96 inches with 1/2-inch rod.
4. NPS 4: 10 feet with 5/8-inch rod.
5. NPS 6: 11 feet with 3/4-inch rod.
6. NPS 8: 12 feet with 7/8-inch rod.
7. NPS 10 to NPS 12: 14 feet with 7/8-inch rod.
- L. Install supports for vertical Schedule 10 stainless steel piping every 15 feet.
- M. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### **3.05 CONNECTIONS**

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect domestic water piping to distribution side of water meter with shutoff valve.
- C. Connect domestic water piping to existing domestic water distribution piping. Use dielectric fitting if connection dissimilar metals. Refer to Application Schedule on the Drawings and Division 20 Section "Basic Mechanical Materials and Methods" for dielectric fittings.
- D. Install piping adjacent to equipment and machines to allow service and maintenance.
- E. Connect domestic water piping to the following:
  1. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Plumbing Fixtures."
  2. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.
  3. Booster Pumps: Cold-water suction and discharge piping.
  4. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

### **3.06 FIELD QUALITY CONTROL**

- A. Inspect domestic water piping as follows:
  1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
  2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
    - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
  3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
  4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- B. Test domestic water piping as follows:
  1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
  2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  4. Cap and subject piping to static water pressure of 150 psig. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
  5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
  6. Prepare reports for tests and required corrective action.

**3.07 ADJUSTING**

- A. Perform the following adjustments before operation:
  - 1. Close drain valves, hydrants, and hose bibbs.
  - 2. Open shutoff valves to fully open position.
  - 3. Open throttling valves to proper setting.
  - 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
    - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
    - b. Adjust calibrated balancing valves to flows indicated.
  - 5. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
  - 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
  - 7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
  - 8. Check plumbing specialties and verify proper settings, adjustments, and operation.

**3.08 CLEANING AND DISINFECTION**

- A. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.
- B. Clean and disinfect potable domestic water piping as follows:
  - 1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
  - 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Fill and isolate system according to either of the following:
      - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
    - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities.

**END OF SECTION 22 1116**

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  1. Division 20 Section "Mechanical General Requirements".
  2. Division 20 Section "Basic Mechanical Materials and Methods".
  3. Division 22 Section "Drainage Piping Specialties".
  4. Division 22 Section "Chemical-Waste Piping" for chemical-waste and vent piping systems.
  5. Division 22 Section "Sewage Pumps."
  6. Division 22 Section "Sanitary Waste and Vent Piping" for piping outside building.

#### 1.02 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. EPDM: Ethylene-propylene-diene terpolymer rubber.
- C. LLDPE: Linear, low-density polyethylene plastic.
- D. NBR: Acrylonitrile-butadiene rubber.
- E. PE: Polyethylene plastic.
- F. PVC: Polyvinyl chloride plastic.
- G. TPE: Thermoplastic elastomer.

#### 1.03 ACTION SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.

**1.04 CLOSEOUT SUBMITTALS**

- A. Field quality-control inspection and test reports.

**1.05 QUALITY ASSURANCE**

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.  
B. Cast-iron soil pipe shall be marked with the collective trademark of Cast Iron Soil Pipe Institute (CISPI).  
C. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

**1.06 PROJECT CONDITIONS**

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
1. Notify Owner no fewer than two days in advance of proposed interruption of sanitary waste service.
  2. Do not proceed with interruption of sanitary waste service without Owner's written permission.

**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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

**2.02 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS**

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.  
B. CISPI, Hubless-Piping Couplings:
1. Manufacturers:
    - a. ANACO-Husky; McWane Plumbing Group.
    - b. Ferguson Enterprises, Inc.; ProFlo (Private labeled IDEAL-TRIDON).
    - c. IDEAL-TRIDON.
    - d. MIFAB, Inc.
    - e. Mission Rubber Company; a division of MCP Industries, Inc.
    - f. Tyler Pipe; McWane Plumbing Group.
  2. Standards: CISPI 310.
  3. Description: NSF certified for compliance with CISPI 310. Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- C. Heavy-Duty, Hubless-Piping Couplings:
1. Manufacturers:
    - a. ANACO-Husky; McWane Plumbing Group; SD 4000.
    - b. Ferguson Enterprises, Inc.; ProFlo (Private labeled IDEAL-TRIDON).
    - c. IDEAL-TRIDON; Heavy-Duty "HD" No-Hub Couplings.
    - d. Norma Group; Clamp-All Products; HI-TORQ 125.
  2. Standards: ASTM C 1277 and ASTM C 1540, or ASTM C 1277 and FM 1680 Class I.
  3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

### **2.03 COPPER TUBE AND FITTINGS**

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
  - 1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- A. Hard Copper Tube: ASTM B 88, Types M , water tube, drawn temper.
  - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
  - 2. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
  - 3. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- B. Hard Copper Tube: ASTM B 88, Types L , water tube, drawn temper.
  - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
  - 2. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
  - 3. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

### **2.04 PVC PIPE AND FITTINGS**

- A. Solid-Wall PVC Pipe: Schedule 40, ASTM D 2665, drain, waste, and vent.
  - 1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

### **2.05 SPECIALTY PIPE FITTINGS**

- A. Flexible, Nonpressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
  - 1. Manufacturers:
    - a. Dallas Specialty & Mfg. Co.
    - b. Fernco, Inc.
    - c. Logan Clay Products Company (The).
    - d. Mission Rubber Co.
    - e. NDS, Inc.
    - f. Plastic Oddities, Inc.
  - 2. Sleeve Materials:
    - a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
    - b. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
    - c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- B. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
  - 1. Manufacturers:
    - a. Cascade Waterworks Mfg. Co.
    - b. Mission Rubber Co.
- C. Rigid, Unshielded, Nonpressure Pipe Couplings: ASTM C 1461, sleeve-type reducing- or transition-type mechanical coupling molded from ASTM C 1440, TPE material with corrosion-resistant-metal tension band and tightening mechanism on each end.
  - 1. Manufacturers:
    - a. ANACO.
- D. Pressure Pipe Couplings: AWWA C219 metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
  - 1. Manufacturers:
    - a. Cascade Waterworks Mfg. Co.
    - b. Dresser, Inc.; DMD Div.
    - c. Ford Meter Box Company, Inc. (The); Pipe Products Div.

- d. JCM Industries, Inc.
  - e. Smith-Blair, Inc.
  - f. Viking Johnson.
- 2. Center-Sleeve Material: Manufacturer's standard.
- 3. Gasket Material: Natural or synthetic rubber.
- 4. Metal Component Finish: Corrosion-resistant coating or material.
- E. Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
  - 1. Manufacturers:
    - a. SIGMA Corp.

### **PART 3 - EXECUTION**

#### **3.01 EXCAVATION**

- A. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

#### **3.02 PIPING SYSTEM INSTALLATION**

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Sanitary sewer piping outside the building is specified in Division 22 Section "Sanitary Sewerage."
- C. Basic piping installation requirements are specified in Division 20 Section "Basic Mechanical Materials and Methods."
- D. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- E. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.
- F. Install underground, ductile-iron, force-main piping according to AWWA C600. Install buried piping inside the building between wall and floor penetrations and connection to sanitary sewer piping outside the building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
- G. Install underground, ductile-iron, special pipe fittings according to AWWA C600.
- H. Install underground, copper, force-main tubing according to Copper Development Association's "Copper Tube Handbook."
- I. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 20 Section "Basic Mechanical Materials and Methods."
- J. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- L. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants,

cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

- M. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
  - 1. Building Sanitary Drain: 1/8-inch per foot downward in direction of flow, unless otherwise noted.
  - 2. Horizontal Sanitary Drainage Piping: 1/8-inch per foot downward in direction of flow, unless otherwise noted.
  - 3. Vent Piping: 1/8-inch per foot down toward vertical fixture vent or toward vent stack.
- N. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- O. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.
- P. Install underground PVC soil and waste drainage piping according to ASTM D 2321.
- Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

### **3.03 JOINT CONSTRUCTION**

- A. Basic piping joint construction requirements are specified in Division 20 Section "Basic Mechanical Materials and Methods."
- B. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
- C. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

### **3.04 SPECIALTY PIPE FITTING INSTALLATION**

- A. Transition Couplings:
  - 1. Install transition couplings at joints of piping with small differences in OD's.
  - 2. In Drainage Piping: Unshielded, nonpressure transition couplings.
  - 3. In Aboveground Force Main Piping: Fitting-type transition couplings.
  - 4. In Underground Force Main Piping:
    - a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
    - b. NPS 2 and Larger: Pressure transition couplings.

### **3.05 VALVE INSTALLATION**

- A. General valve installation requirements are specified in Division 20 Section "Valves."
- B. Shutoff Valves: Install shutoff valve on each sewage pump discharge.
- C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

### **3.06 HANGER AND SUPPORT INSTALLATION**

- A. Pipe hangers and supports are specified in Division 20 Section "Hangers and Supports." Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 2. Install individual, straight, horizontal piping runs according to the following:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 20 Section "Hangers and Supports."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.

2. NPS 3: 60 inches with 1/2-inch rod.
  3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
  4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
  5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
- F. Install supports for vertical cast-iron soil piping every 15 feet.
- G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### **3.07 CONNECTIONS**

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
  2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
  3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
  4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Connect force-main piping to the following:
1. Sanitary Sewer: To exterior force main or sanitary manhole.
  2. Sewage Pumps: To sewage pump discharge.

### **3.08 IDENTIFICATION**

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Division 20 Section "Mechanical Identification."

### **3.09 FIELD QUALITY CONTROL**

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.
- E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  2. Cap and subject piping to static-water pressure of 150 psig, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
  3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  4. Prepare reports for tests and required corrective action.

### **3.10 CLEANING**

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

### **END OF SECTION 22 1316**

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  1. Division 10 Section "Toilet and Bath Accessories."
  2. Division 20 Section "Mechanical General Requirements."
  3. Division 20 Section "Basic Mechanical Materials and Methods."
  4. Division 22 Section "Medical Plumbing Fixtures."
  5. Division 22 Section "Emergency Plumbing Fixtures."
  6. Division 22 Section "Security Plumbing Fixtures."
  7. Division 22 Section "Drinking Fountains and Water Coolers."
  8. Division 22 Section "Domestic Water Piping Specialties" for backflow preventers; individual-fixture, water tempering valves; and specialty fixtures not included in this Section.
  9. Division 22 Section "Drainage Piping Specialties" for floor drains, and specialty fixtures not included in this Section.
  10. Division 22 Section "Water Distribution" for exterior plumbing fixtures and hydrants.

#### 1.02 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.

- B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- C. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.
- D. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.
- E. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.
- F. FRP: Fiberglass-reinforced plastic.
- G. PMMA: Polymethyl methacrylate (acrylic) plastic.
- H. PVC: Polyvinyl chloride plastic.
- I. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

### **1.03 ACTION SUBMITTALS**

- A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

### **1.04 INFORMATIONAL SUBMITTALS**

- A. Shop Drawings: Diagram power, signal, and control wiring.
- B. Coordination Drawings: Counter cutout templates for mounting of counter-mounted plumbing fixtures.

### **1.05 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For plumbing fixtures and trim to include in operation and maintenance manuals.

### **1.06 QUALITY ASSURANCE**

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
  - 1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by an NRTL acceptable to authorities having jurisdiction, and marked for intended use.
- C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" for plumbing fixtures for people with disabilities.
- D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- E. Regulatory Requirements: Comply with requirements in Public Law 111-380, "Reduction of Lead in Drinking Water Act," about lead content in materials that will be in contact with potable water for human consumption.
- F. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," and NSF 372 Drinking Water System Components – Lead Content for potable domestic water piping and components.
- G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- H. Comply with applicable ANSI, ASME, ASSE, ASTM, ICC, NSF, and UL standards and other requirements specified for plumbing fixtures, trim, fittings, components, and features.

**1.07 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

**PART 2 - PRODUCTS**

**2.01 WATER CLOSETS**

- A. Water Closets, WC-1:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Standard Companies, Inc.; Afwall Wall Hung Elongated Toilet.
    - b. Ferguson Enterprises, Inc.; ProFlo.
    - c. Kohler Co.; Kingston K-4325-0.
    - d. Sloan Valve Company.
    - e. Zurn Plumbing Products Group; EcoVantage.
  2. Description: Wall-mounting, back-outlet, vitreous-china fixture designed for flushometer valve operation.
    - a. Style: Flushometer valve.
      - 1) Bowl Type: Elongated with siphon-jet design.
      - 2) Supply Spud Location: Top.
      - 3) Design Consumption: 1.28 gal./flush or 1.6 gal./flush.
      - 4) Color: White.
    - b. Flushometer: FV-2-1.
    - c. Toilet Seat: TS-1
    - d. Fixture Support: Water-closet support combination carrier.

**2.02 MANUAL WATER CLOSET FLUSHOMETERS**

- A. Flushometers, FV-2-1:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Standard Companies, Inc.
    - b. Delany Products.
    - c. Delta Faucet Company; 81T201.
    - d. Kohler Co.; MACH Series.
    - e. Sloan Valve Company.
    - f. Zurn Plumbing Products Group.
  2. Description: Flushometer for water-closet-type fixture. Include brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, copper or brass tubing, and polished chrome-plated finish on exposed parts.
    - a. Internal Design: Diaphragm or piston operation.
    - b. Style: Exposed.
    - c. Inlet Size: NPS 1.
    - d. Trip Mechanism: Oscillating, low-force ADA compliant lever-handle actuator.
    - e. Consumption: 1.28 gal./flush.
    - f. Tailpiece Size: NPS 1-1/2 and standard length to top of bowl.
- B. Flushometers, FV-2-1-DF:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Standard Companies, Inc.
    - b. Sloan Valve Company; UpperCut.
    - c. Zurn Plumbing Products Group; Z6000-WS1-DF.
  2. Description: Flushometer for water-closet-type fixture. Include brass body with corrosion-resistant internal components, non-hold-open feature, dual flush feature, control stop with

check valve, vacuum breaker, copper or brass tubing, and polished chrome-plated finish on exposed parts.

- a. Internal Design: Diaphragm operation.
- b. Style: Exposed.
- c. Inlet Size: NPS 11.6 gal./flush 1.1 gal./flush NPS 1-1/2.

## **2.03 URINALS**

### **A. Urinals, UR-1:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Standard Companies, Inc.; Washbrook Urinal System.
  - b. Kohler Co.; Bardon K 4991-ETSS.
  - c. Sloan Valve Company.
  - d. Zurn Industries, Inc.; EcoVantage.
2. Description: Wall-mounting, back-outlet, ultra-low water consumption, vitreous-china fixture designed for flushometer valve operation.
  - a. Type: High efficiency.
  - b. Strainer or Trapway: Open trapway with integral trap.
  - c. Design Consumption: Operates in the range of 1/8 gal./flush to 1 gal./flush.
  - d. Color: White.
  - e. Supply Spud Size: NPS 3/4.
  - f. Supply Spud Location: Top.
  - g. Outlet Size: NPS 2 .
  - h. Flushometer: FV-1-1.
  - i. Fixture Support: Urinal chair carrier.

## **2.04 MANUAL URINAL FLUSHOMETERS**

### **A. Flushometers, FV-1-1:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Standard Companies, Inc.
  - b. Delany Products.
  - c. Delta Faucet Company; 81T231.
  - d. Kohler Co.; MACH Series.
  - e. Sloan Valve Company.
  - f. Zurn Plumbing Products Group; Z6003-WS1.
2. Description: Flushometer for urinal-type fixture. Include brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, copper or brass tubing, and polished chrome-plated finish on exposed parts.
  - a. Internal Design: Diaphragm or piston operation.
  - b. Style: Exposed.
  - c. Inlet Size: NPS 3/4.
  - d. Trip Mechanism: Oscillating, low-force ADA compliant lever-handle actuator.
  - e. Consumption: 0.5 gal./flush.
  - f. Tailpiece Size: NPS 3/4 and standard length to top of fixture.

## **2.05 TOILET SEATS**

### **A. Toilet Seats, TS-1:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Bemis Manufacturing Company; 1955SSC/1955SSCT.
  - b. Centoco Manufacturing Corp.
  - c. Church Seats; 295SSC/295SSCT.
  - d. Comfort Seats; a Jones Stephens Brand; Model Number C106SSC.
  - e. Ferguson Enterprises, Inc.; ProFlo PFTSCOF2000WH.

- f. Olsonite Seat Company; Model 10SSC/10SSCT.
  - g. Plumbtech; Plumbing Technologies, LLC.
  - h. Sanderson Plumbing Products, Inc.; Beneke Div.
  - i. Zurn Plumbing Products Group; 5955STS-WH.
2. Description: Toilet seat for water-closet-type fixture.
- a. Material: Molded, solid plastic.
  - b. Configuration: Open front without cover.
  - c. Size: Elongated.
  - d. Hinge Type: SC, self-sustaining, check.
  - e. Class: Standard commercial.
  - f. Color: White.

## **2.06 LAVATORIES**

### **A. Lavatories, LAV-1:**

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Standard Companies, Inc.; Aqualyn Model 0475.028.
  - b. Ferguson Enterprises, Inc.; ProFlo PF5204.
  - c. Kohler Co.; K 2196-4 Pennington.
  - d. Sloan Valve Company.
  - e. Zurn Plumbing Products Group; Z5114.
- 2. Description: Accessible, counter-mounting, vitreous-china fixture.
  - a. Type: Self-rimming.
  - b. Oval Lavatory Size: 20 by 17 inches.
  - c. Faucet Hole Punching: Three holes, 2-inch centers.
  - d. Color: White.
  - e. Faucet: LF-1.
  - f. Water Temperature Limiting Device: Required.
  - g. Drain: Grid.
  - h. Drain Piping: NPS 1-1/4 chrome-plated, cast-brass P-trap; NPS 1-1/4, 17 gage tubular brass waste to wall; and wall escutcheon.

## **2.07 LAVATORY FAUCETS**

### **A. Lavatory Faucets, LF-1:**

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Standard Companies, Inc.; Reliant 3 Model 7385.003/7385.043.
  - b. Chicago Faucets.
  - c. Delta Faucet Company; Model 523LF-HDF.
  - d. Kohler Co.
  - e. Moen Commercial.
  - f. Speakman Company; Model S-3561.
  - g. T & S Brass and Bronze Works, Inc.; B-2711.
  - h. Zurn Plumbing Products Group; Z7440.
- 2. Description: Single handle mixing faucet, vandal resistant, 2 or 3 holes, with metal grid strainer, no lift rod hole, high temperature limit stop.
  - a. Body Material: Commercial, all metal construction meeting NSF 61.
  - b. Finish: Polished chrome plate.
  - c. Centers: 4 inches.
  - d. Mounting: Deck, concealed.
  - e. Inlet(s): NPS 1/2.
  - f. Spout Outlet:
    - 1) Vandal resistant aerator.
    - 2) Laminar flow or plain end for patient care areas.
  - g. Maximum Flow Rate:

- 1) 0.5 gpm for faucets in public restrooms.
  - 2) 1.5 gpm.
- B. Lavatory Faucets, LF-2:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Standard Companies, Inc.; Heritage Model 5400.142H.
    - b. Chicago Faucets; Model 802V-317.
    - c. Delta Faucet Company; Model 21C132.
    - d. Kohler Co.; K7404-KE 1 K16010-5.
    - e. Moen Commercial.
    - f. Speakman Company; Model SC-3075.
    - g. T & S Brass and Bronze Works, Inc.
    - h. Zurn Plumbing Products Group; Z81104.
  2. Description: Two-handle mixing faucet, vandal resistant, 2 holes, less grid strainer, and no lift rod hole.
    - a. Body Material: Commercial, solid brass.
    - b. Finish: Polished chrome plate.
    - c. Centers: 4 inches.
    - d. Mounting: Deck, concealed.
    - e. Valve Handle(s): Wrist blade, 4 inches.
    - f. Operation: Noncompression, manual.
    - g. Inlet(s): NPS 1/2.
    - h. Spout Outlet:
      - 1) Vandal resistant aerator.
      - 2) Laminar flow or plain end for patient care areas.
    - i. Maximum Flow Rate:
      - 1) 0.5 gpm for faucets in public restrooms.
      - 2) 1.5 gpm.

## **2.08 COUNTER-MOUNTING SINKS**

- A. Sinks, SK-1:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Elkay Manufacturing Co.
    - b. Franke Consumer Products, Inc., Commercial Div.
    - c. Just Manufacturing Company.
    - d. Moen Commercial.
  2. Description: Single-bowl, counter-mounting, lay-in stainless-steel sink.
    - a. Overall Dimensions: 22 inches left to right by 19 inches front to back.
    - b. Metal Thickness: 18 gage, with sound dampened underside.
    - c. Bowl:
      - 1) Dimensions: 18 inches by 14 inches by 7-1/2 inches deep.
      - 2) Drain: 3-1/2-inch grid.
    - d. Sink Faucet: SF-1.
    - e. Drain Piping: NPS 1-1/2 chrome-plated, cast-brass P-trap; 17 gage tubular brass waste to wall; and wall escutcheon(s).
    - f. Disposer: Not required.
    - g. Dishwasher Air-Gap Fitting: Not required.
    - h. Hot-Water Dispenser: Not required.

## **2.09 FIXTURE SUPPLIES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. BrassCraft; a Masco Company.
  2. McGuire Mfg. Co., Inc.

3. Any of the approved plumbing fixture manufacturers.
- B. Description: Chrome-plated brass, loose-key or screwdriver angle stops with brass stems; rigid, chrome-plated copper risers; and chrome-plated wall flanges.

## **2.10 PROTECTIVE SHIELDING GUARDS**

- A. Protective Shielding Pipe Covers (PSG-1):
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Engineered Brass Co.
    - b. Insul-Tect Products Co.; a Subsidiary of MVG Molded Products.
    - c. McGuire Manufacturing Co., Inc.
    - d. Oatey; Dearborn Safety Series.
    - e. Plumberex Specialty Products Inc.
    - f. TCI Products; SG-200BV.
    - g. TRUEBRO, Inc.
    - h. Zurn Plumbing Products Group; Z8946-3-NT.
  2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.
- B. Protective Shielding Piping Enclosures (PSG-2):
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Sloan Valve Co.
    - b. TRUEBRO, Inc.
    - c. Zurn Plumbing Products Group; Z6900-VG
  2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

## **2.11 FIXTURE SUPPORTS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Josam Company.
  2. MIFAB Manufacturing Inc.
  3. Smith, Jay R. Mfg. Co.
  4. Tyler Pipe; Wade Div.
  5. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
  6. Zurn Plumbing Products Group; Specification Drainage Operation.
- B. Water-Closet Supports:
  1. Description: Combination carrier designed for wall-mounting, water-closet-type fixture. Include:
    - a. Single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement.
    - b. Faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture.
    - c. Cast iron nipple and coupling kit.
    - d. Additional extension coupling, faceplate, and feet for installation in wide pipe space.
- C. Urinal Supports:
  1. Description: For wall-mounting, urinal-type fixture. Include steel uprights with feet.
  2. Accessible-Fixture Support: Include rectangular steel uprights.
- D. Lavatory Supports:
  1. Description: Lavatory carrier with concealed arms and tie rods for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
  2. Accessible-Fixture Support: Include rectangular steel uprights.

- E. Sink Supports:
  - 1. Description: For wall-mounting sink-type fixture. Include steel uprights with feet.
    - a. Type I, sink carrier with exposed arms and tie rods.
    - b. Type II, sink carrier with hanger plate, bear studs, and tie rod.
    - c. Type III, sink carrier with hanger plate and exposed arms.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.
- B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.02 INSTALLATION**

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
  - 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
  - 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
  - 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.
- D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- E. Install wall-mounting fixtures with tubular waste piping attached to supports.
- F. Install wall-mounting urinals with PVC-DWV piping from urinal outlet to first change in piping direction.
- G. Install counter-mounting fixtures in and attached to casework.
- H. Install fixtures level and plumb according to roughing-in drawings. Install accessible fixtures at heights required by local codes.
- I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
  - 1. Exception: Fixtures with flushometer valves, and faucets or valves with integral stops.
- J. Install ASSE 1070 water-temperature limiting devices on supplies for lavatories and sinks that will be used for handwashing, and where specified. Refer to Division 20 Section "Domestic Water Piping Specialties."
- K. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- L. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- M. Install protective shielding guards PSG-1 on exposed traps and supplies of lavatories, and sinks used for hand washing.
- N. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- O. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
- P. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- Q. Install traps on fixture outlets.
  - 1. Exception: Omit trap on fixtures with integral traps.
  - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.



- R. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 20 Section "Basic Mechanical Materials and Methods."
- S. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

### **3.03 CONNECTIONS**

- A. Piping installation requirements are specified in other Division 20 and 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- C. Individual water line branches, waste lines, vents, and traps for connection to individual fixtures, fixture fittings and specialties shall be in accordance with the schedule on the Drawings.
- D. Ground equipment according to Division 26 Section "Grounding and Bonding."
- E. Connect wiring according to Division 26 Section "Conductors and Cables."

### **3.04 FIELD QUALITY CONTROL**

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

### **3.05 ADJUSTING**

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.
- C. Adjust flow at laboratory faucets having serrated nozzles to prevent splashing.
- D. Replace washers and seals, or cartridges of leaking and dripping faucets and stops.

### **3.06 CLEANING**

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
  - 1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
  - 2. Remove sediment and debris from drains.
- B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

### **3.07 PROTECTION**

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

## **END OF SECTION 22 4200**

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## SECTION 23 0500 - COMMON WORK RESULTS FOR HVAC

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### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  - 1. Division 20 Section "Mechanical General Requirements."
  - 2. Division 20 Section "Basic Mechanical Materials and Methods."
  - 3. Division 23 Section "Testing, Adjusting, and Balancing."

#### 1.02 SUMMARY

- A. This Section includes common requirements for fans and air moving equipment.

#### 1.03 SUBMITTALS

- A. Product Data: For the following:
  - 1. Fan bearings.
  - 2. V-belt fan drives.
  - 3. Direct drive couplings.

#### 1.04 QUALITY ASSURANCE

- A. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.
- B. Fan Performance Data: AMCA Standard 210.
- C. Sound Power Level Ratings:
  - 1. Ducted Fans - Rated per AMCA 301, when tested per AMCA 300.
  - 2. Nonducted Fans - Rated in Zones at 5 feet from acoustic center of fan rated per AMCA 301, tested per AMCA 300 and converted per AMCA 302.

## **1.05 ENVIRONMENTAL REQUIREMENTS**

- A. Do not operate equipment for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### **2.02 FAN SHAFTS**

- A. Fan Shafts: Ground from solid cold rolled steel, and proportioned to run at least 25 percent below the first critical speed.

### **2.03 FAN POWER TRANSMISSION**

- A. V-Belt Type Fan Drives: In accordance with Engineering Standard Specification for Drives Using Multiple V-Belts, sponsored by the Mechanical Power Transmission Association and the Rubber Manufacturer's Association.
- B. A given manufacturer's V-belt drive, as applied to specific equipment provided under the Contract, shall conform to the equipment manufacturer's published recommendations, except as otherwise specified.
- C. Base horsepower rating of drive on minimum pitch diameter of small sheave.
- D. Locate belt drives outboard of bearings. Align drive and driven shafts by the four-point method.
- E. Adjust belt tension in accordance with the manufacturer's recommendations.
- F. Perform alignment and final belt tensioning in the presence of the Architect.

### **2.04 SHEAVES**

- A. Furnish sheaves of machined cast iron or carbon steel, bushing type of fixed bore, secured to the shaft by key and keyway.
- B. For all constant speed fans at or above 2 inches of total static pressure, Contractor shall provide and install two sets of fixed sheaves. First set shall be installed for initial start-up and shall be based on scheduled data. The second set shall be installed after system balance is complete and shall be based on actual field conditions.
- C. For all constant speed fans below 2 inches total static pressure, Contractor shall provide and install two sets of adjustable sheaves. First set shall be installed for initial start-up and shall be based on scheduled data. The second set shall be installed after the balance is complete and shall be based on actual field conditions, and selected at mid-range of the sheave.
- D. Set pitch diameters of fixed pitch and adjustable or variable pitch sheaves when adjusted as specified, at not less than that recommended by NEMA Standard MG1-14.42.
- E. For companion sheaves for adjustable or variable pitch drives, furnish wide groove spacing to match driving sheaves.
- F. For all variable frequency controller (VFC) operated fans, contractor shall provide and install one set of fixed sheaves sized to allow full utilization of fan motor horsepower provided, with VFC at 100 percent of fan motor RPM.

### **2.05 V-BELT FAN DRIVES**

- A. Fan Drives: Multiple V-belt style with adjustable pitch driver sheaves for fans up to 2 inches of total static pressure and fixed pitch driver sheaves for fans at or above 2 inches of total static pressure and up. Sheaves shall have split, taper style bushings. Drives shall be selected for a 150 percent service factor and shall provide for adjustment of both belt tension and alignment.
- B. Manufacturers:
  - 1. Emerson Power Transmission; Browning.

2. Rockwell Automation; Dodge.
3. T.B. Wood's Incorporated.

## **2.06 FAN DRIVE, SHAFT, AND COUPLING GUARDS**

- A. Safety Provisions: Include guards and screens for power transmission equipment, but do not negate vibration isolation provision.
- B. Furnish ANSI and OSHA compliant mechanical power transmission apparatus guards except where superseded by other governing codes, and except as modified and supplemented. Requirements specified apply to all types of fans.
- C. Fabricate mechanical power transmission device guards such that the completed structure is capable of withstanding a load of at least 200 pounds applied in any direction.
- D. Furnish a guard enclosure for each V-belt drive, coupling, shaft, and rotating component. Secure guards in place, easily removable for maintenance. Guard fasteners used for maintenance access shall be "captive type." Locate holes on each guard for tachometer readings on both the motor and fan shafts. Fabricate guard of minimum 16 gage sheet metal with hemmed edges at openings for shafts. Weld four mounting lugs or feet of 10 gage material to the guard. Fabricate guards for couplings five inches in diameter and larger of 12 gage sheet metal. Furnish holes in mounting feet sized for suitable machine screws.
- E. Centrifugal exhaust fans shall be provided with shaft seals.

## **2.07 BELT DRIVE GUARDS**

- A. Belt Guards: ANSI and OSHA compliant with provision for readily viewing belt tension and measuring shaft speeds. Guards shall be installed with quick release pins, so that removal of three to five clip pins, will allow the guard to be removed from fan housing.
- B. Fabricate guards which completely enclose moving parts of the particular drive. Design and construct guards of such rigidity as to contain a belt which breaks during operation. Minimum material thickness, 16 gage sheet metal. Where ventilation is required, perforated metal shall be used for the sides. Fabricate top of solid sheet metal.

## **2.08 V-BELTS**

- A. Notched or cogged style, endless type, of Dacron reinforced elastomer construction, with cross-section to suit sheave grooves. Determine the number of V-belts from the motor horsepower to which apply the service factor to obtain the design horsepower. Determine the corrected horsepower per belt by multiplying the nominal horsepower per belt by an arc of contact factor not greater than 0.85. Divide the design horsepower by the corrected horsepower per belt to obtain the number of belts required. In any case, furnish not less than two belts for each drive.
- B. Furnish belts that have been factory or factory-authorized distributor matched and measured on a belt-matching machine. Selection by "code numbers," "sag numbers" or "match numbers" is not acceptable. Bind each belt set with wire and tag with equipment identification.
- C. Manufacturers:
  1. Emerson Power Transmission; Browning; AX, BX, and CX Series and 3VX and 5VX Series.
  2. Rockwell Automation; Dodge; Classic Cog and Narrow Cog V-Belts.
  3. T.B. Wood's Incorporated; Classical Cog and Narrow Cog V-Belts.

## **2.09 V-BELT DRIVE MOTOR BASES**

- A. Furnish fan motors with slide or adjustable pivoted bases wherever equipment configuration permits proper installation.
- B. Provide for adjustment of both belt tension and alignment.

## **2.10 AIR HANDLING SYSTEM BALANCING PROVISIONS**

- A. Provide extra sheaves, sized as recommended by the Balancing Agent, for the adjustment of fan speed for each air handling system during air quantity balancing operations. Furnish sheaves as specified in this Section.

**2.11 FLEXIBLE COUPLINGS (DIRECT DRIVE)**

- A. Fan shaft shall be connected to the motor shaft through a flexible coupling. The flexible member shall be a tire shape, in shear, or a solid mass serrated edge disc shape, made of chloroprene materials and retained by fixed flanges. Flexible coupling shall act as a dielectric connector and shall not transmit sound, vibration or end thrust.
- B. Manufacturer:
  - 1. Falk Corporation (The).

**2.12 MOTOR REQUIREMENTS**

- A. Furnish motors in accordance with Division 20 Section "Motors."

**2.13 FAN BEARINGS**

- A. Bearings: Anti-friction ball or roller type with provision for self-alignment and thrust load. Made in U.S.A. with ABMA L<sub>10</sub> minimum life of 200,000 hours. Use cast iron housings and dust-tight seals suitable for lubricant pressures.
  - 1. Lubrication Provisions - Use surface ball check type supply fittings. Provide extension tubes to allow safe maintenance while equipment is operating. Provide manual or automatic pressure relief fittings to prevent overheating or seal blow-out due to excess lubricant or pressure. Arrange relief fittings opposite supply but visible for normal maintenance observation.
  - 2. Bearings on Equipment with less than 1/2 horsepower rating or on shafts smaller than 1-3/4 inch in diameter: Permanently sealed, pre-lubricated anti-friction bearings per specified materials and ABMA L<sub>10</sub> life requirements.

**2.14 IDENTIFICATION**

- A. Nameplate: Affix metallic, corrosion-resistant data plate for each fan in a conspicuous location. Include selection point capacity conditions.

**2.15 ACCESSORIES**

- A. Bird Screens: Of material to match adjacent contact construction, 1/2 inch mesh or equal expanded metal. Use on inlet or outlet of each nonducted fan.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Field Rigging: Do not negate balancing. Do not bend shaft. Use lifting eyes.
- B. Install sheaves where recommended by Testing, Adjusting, and Balancing agency.
- C. Refer to individual Division 23 HVAC equipment Sections for additional requirements.

**END OF SECTION 23 0500**

## SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  - 1. Division 20 Section "Mechanical General Requirements."
  - 2. Division 20 Section "Basic Mechanical Materials and Methods."
  - 3. Division 23 Section "Common Work Results for HVAC."

#### 1.02 SUMMARY

- A. This Section includes testing, adjusting, and balancing to produce design objectives for the following:
  - 1. Air Systems:
    - a. Constant-volume air systems.
    - b. Variable-air-volume systems.
  - 2. Hydronic Piping Systems:
    - a. Constant-flow systems.
    - b. Variable-flow systems.
    - c. Primary-secondary systems.
  - 3. Verifying that automatic control devices are functioning properly.
  - 4. Reporting results of activities and procedures specified in this Section.
- B. Include rebalancing of air systems, or system portions affected by recommended sheave changes.

#### 1.03 DEFINITIONS

- A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.
- B. AHJ: Authority having jurisdiction.

- C. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.
- D. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.
- E. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.
- F. NC: Noise criteria.
- G. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.
- H. RC: Room criteria.
- I. Report Forms: Test data sheets for recording test data in logical order.
- J. Smoke-Control System: An engineered system that uses fans to produce airflow and pressure differences across barriers to limit smoke movement.
- K. Smoke-Control Zone: A space within a building that is enclosed by smoke barriers and is a part of a zoned smoke-control system.
- L. Stair Pressurization System: A type of smoke-control system that is intended to positively pressurize stair towers with outdoor air by using fans to keep smoke from contaminating the stair towers during an alarm condition.
- M. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.
- N. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.
- O. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- P. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.
- Q. TAB: Testing, adjusting, and balancing.
- R. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.
- S. Test: A procedure to determine quantitative performance of systems or equipment.
- T. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

#### **1.04 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: Within 15 days from Contractor's Notice to Proceed, submit 2 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 15 days from Contractor's Notice to Proceed, submit 2 copies of the Contract Documents review report as specified in Part 3.
- C. Strategies and Procedures Plan: Within 30 days from Contractor's Notice to Proceed, submit 2 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.
- D. Sample Report Forms: Submit two sets of sample TAB report forms.

#### **1.05 CLOSEOUT SUBMITTALS**

- A. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.
- B. Warranties specified in this Section.

#### **1.06 QUALITY ASSURANCE**

- A. TAB Firm Qualifications: Engage a TAB firm certified by either AABC or NEBB.
- B. Smoke Control System Testing: Additional Qualifications: The TAB firm shall be a qualified special inspector for the smoke control systems. The TAB firm for the smoke control system shall



have expertise in fire protection engineering, mechanical engineering, and certification as air balancers.

C. Approved Balancing Agencies.

1. The TAB firm selected shall be from the following list:

- a. Airflow Testing Inc.; Lincoln Park, MI.
- b. Barmatic Inspecting Co., Inc.; Lincoln Park, MI.
- c. Ener-Tech Testing; Holly, MI.
- d. Enviro-Aire/Total Balance Co.; St. Clair Shores, MI.
- e. International Test & Balance Inc.; Southfield, MI.
- f. Quality Air Service; Portage, MI.
- g. Pro-MEC Engineering Services, Inc.; Grand Ledge, MI.
- h. Hi-Tech Test & Balance; Freeland, MI.
- i. Integrity Test & Balance, Inc.; Traverse City, MI.
- j. Northern Consulting Services UP, LLC; Marquette, MI.
- k. AirEconomics, Inc.; Grand Rapids, MI.
- l. Air Solutions, Inc.; Lapeer, MI.

D. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

E. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems." TAB firm's forms approved by Architect.

F. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

G. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

**1.07 PROJECT CONDITIONS**

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.
- B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

**1.08 COORDINATION**

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.
- B. Notice: Provide seven days advance notice for each test. Include scheduled test dates and times.

**1.09 WARRANTY**

- A. National Project Performance Guarantee: If AABC standards are used, provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:
  1. The certified TAB firm has tested and balanced systems according to the Contract Documents.

2. Systems are balanced to optimum performance capabilities within design and installation limits.
- B. Special Guarantee: If NEBB standards are used, provide a guarantee on NEBB forms stating that NEBB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee shall include the following provisions:
  1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
  2. Systems are balanced to optimum performance capabilities within design and installation limits.

## **PART 2 - PRODUCTS (NOT APPLICABLE)**

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.
- B. Examine system and equipment test reports.
- C. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- D. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- E. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.
- F. Examine plenum ceilings used for supply air to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.
- G. Examine strainers for clean screens and proper perforations.
- H. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- I. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- J. Examine system pumps to ensure absence of entrained air in the suction piping.
- K. Examine equipment for installation and for properly operating safety interlocks and controls.
- L. Examine automatic temperature system components to verify the following:
  1. Dampers, valves, and other controlled devices are operated by the intended controller.
  2. Dampers and valves are in the position indicated by the controller.
  3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
  4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
  5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
  6. Sensors are located to sense only the intended conditions.
  7. Sequence of operation for control modes is according to the Contract Documents.
  8. Controller set points are set at indicated values.
  9. Interlocked systems are operating.
  10. Changeover from heating to cooling mode occurs according to indicated values.
- M. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

### **3.02 PREPARATION**

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Perform the following field tests and inspections to new and renovated portions of duct systems according to SMACNA's "HVAC Air Duct Leakage Test Manual" and prepare test reports:
  - 1. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.
  - 2. Maximum Allowable Leakage: Leakage rates are scheduled on the Drawings.
  - 3. Maximum Allowable Leakage: 5 percent.
  - 4. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round and flat-oval ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (both positive and negative pressures), and Leakage Class 6 for pressure classes from 2- to 10-inch wg.
- C. Complete system readiness checks and prepare system readiness reports. Verify the following:
  - 1. Permanent electrical power wiring is complete.
  - 2. Hydronic systems are filled, clean, and free of air.
  - 3. Automatic temperature-control systems are operational.
  - 4. Equipment and duct access doors are securely closed.
  - 5. Balance, smoke, and fire dampers are open.
  - 6. Isolating and balancing valves are open and control valves are operational.
  - 7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
  - 8. Windows and doors can be closed so indicated conditions for system operations can be met.

### **3.03 GENERAL PROCEDURES FOR TESTING AND BALANCING**

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.
- B. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.
- C. Take and report testing and balancing measurements in inch-pound (IP) units.

### **3.04 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS**

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts, or use reduced scale contract documents with notations.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- E. Cut insulation, and drill ducts for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes with neat patches, neoprene plugs, threaded plugs, or threaded twist-on metal caps, and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.
- F. Check air flow within intake plenums and mixing boxes of air handling units for uneven flow and temperature stratification and prepare a report with profile elevations (temperature and velocity) on each coil or filter face for Architect.
- G. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- H. Verify that motor starters are equipped with properly sized thermal protection.
- I. Check dampers for proper position to achieve desired airflow path.

- J. Check for airflow blockages.
- K. Check condensate drains for proper connections and functioning.
- L. Check for proper sealing of air-handling unit components.
- M. Check for proper sealing of air duct system.

### **3.05 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS**

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
  - 1. Measure and record the operating speed, airflow, and static pressure of each fan.
  - 2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
  - 3. Check the condition of filters.
  - 4. Check the condition of coils.
  - 5. Check the operation of the drain pan and condensate drain trap.
  - 6. Check bearings and other lubricated parts for proper lubrication.
  - 7. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.
- B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished.
  - 1. New filters are installed.
  - 2. Coils are clean and fins combed.
  - 3. Drain pans are clean.
  - 4. Fans are clean.
  - 5. Bearings and other parts are properly lubricated.
  - 6. Deficiencies noted in the preconstruction report are corrected.
- C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
  - 1. Compare the indicated airflow of the renovated work to the measured fan airflows and determine the new fan, speed, filter, and coil face velocity.
  - 2. If calculations increase or decrease the airflow and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated airflow and water flow rates. If 5 percent or less, equipment adjustments are not required.
  - 3. Air balance each air outlet.

### **3.06 TOLERANCES**

- A. Set HVAC system airflow and water flow rates within the following tolerances:
  - 1. Air handling equipment and outlets: Plus or minus 5 percent.
    - a. Where terminal units serve 6 or more outlets within a common room, individual outlets may vary up to plus or minus 10 percent of design flow rates if overall room supply is within plus or minus 5 percent.
  - 2. Heating-Water Flow Rate: 0 to minus 10 percent.
  - 3. Cooling-Water Flow Rate: 0 to plus 5 percent.

### **3.07 REPORTING**

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

**3.08 FINAL REPORT**

- A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
  - 1. Include a list of instruments used for procedures, along with proof of calibration.
- C. Final Report Contents: In addition to certified field report data, include the following:
  - 1. Pump curves.
  - 2. Fan curves.
  - 3. Manufacturers' test data.
  - 4. Field test reports prepared by system and equipment installers.
  - 5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.
- D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
  - 1. Title page.
  - 2. Name and address of TAB firm.
  - 3. Project name.
  - 4. Project location.
  - 5. Architect's name and address.
  - 6. Engineer's name and address.
  - 7. Contractor's name and address.
  - 8. Report date.
  - 9. Signature of TAB firm who certifies the report.
  - 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
  - 11. Summary of contents including the following:
    - a. Indicated versus final performance.
    - b. Notable characteristics of systems.
    - c. Description of system operation sequence if it varies from the Contract Documents.
  - 12. Nomenclature sheets for each item of equipment.
  - 13. Notes to explain why certain final data in the body of reports varies from indicated values.
  - 14. Test conditions for fans and pump performance forms including the following:
    - a. Settings for outside-, return-, and exhaust-air dampers.
    - b. Conditions of filters.
    - c. Cooling coil, wet- and dry-bulb conditions.
    - d. Face and bypass damper settings at coils.
    - e. Fan drive settings including settings and percentage of maximum pitch diameter.
    - f. Inlet vane settings for variable-air-volume systems.
    - g. Settings for supply-air, static-pressure controller.
    - h. Other system operating conditions that affect performance.
- E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
  - 1. Quantities of outside, supply, return, and exhaust airflows.
  - 2. Water flow rates.
  - 3. Terminal units.
  - 4. Balancing stations.
- F. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
  - 1. Report Data:
    - a. System and air-handling unit number.
    - b. Location and zone.
    - c. Traverse air temperature in deg F.
    - d. Duct static pressure in inches wg.
    - e. Duct size in inches.
    - f. Duct area in sq. ft.

- g. Indicated airflow rate in cfm.
  - h. Indicated velocity in fpm.
  - i. Actual airflow rate in cfm.
  - j. Actual average velocity in fpm.
  - k. Barometric pressure in psig.
- G. Vibration Measurement Reports:
  - 1. Date and time of test.
  - 2. Vibration meter manufacturer, model number, and serial number.
  - 3. Equipment designation, location, equipment, speed, motor speed, and motor horsepower.
  - 4. Diagram of equipment showing the vibration measurement locations.
  - 5. Measurement readings for each measurement location.
  - 6. Calculate isolator efficiency using measurements taken.
  - 7. Description of predominant vibration source.
- H. Sound Measurement Reports: Record sound measurements on octave band and dBA test forms and on an NC or RC chart indicating the decibel level measured in each frequency band for both "background" and "HVAC system operating" readings. Record each tested location on a separate NC or RC chart. Record the following on the forms:
  - 1. Date and time of test. Record each tested location on its own NC curve.
  - 2. Sound meter manufacturer, model number, and serial number.
  - 3. Space location within the building including floor level and room number.
  - 4. Diagram or color photograph of the space showing the measurement location.
  - 5. Time weighting of measurements, either fast or slow.
  - 6. Description of the measured sound: steady, transient, or tonal.
  - 7. Description of predominant sound source.
- I. Indoor-Air Quality Measurement Reports for Each HVAC System:
  - 1. HVAC system designation.
  - 2. Date and time of test.
  - 3. Outdoor temperature, relative humidity, wind speed, and wind direction at start of test.
  - 4. Room number or similar description for each location.
  - 5. Measurements at each location.
  - 6. Observed deficiencies.
- J. Instrument Calibration Reports:
  - 1. Report Data:
    - a. Instrument type and make.
    - b. Serial number.
    - c. Application.
    - d. Dates of use.
    - e. Dates of calibration.

### 3.09 INSPECTIONS

- A. Initial Inspection:
  - 1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
  - 2. Randomly check the following for each system:
    - a. Measure airflow of at least 10 percent of air outlets.
    - b. Measure water flow of at least 5 percent of terminals.
    - c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
    - d. Measure sound levels at two locations.
    - e. Measure space pressure of at least 10 percent of locations.
    - f. Verify that balancing devices are marked with final balance position.
    - g. Note deviations to the Contract Documents in the Final Report.

B. Final Inspection:

1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Owner.
2. TAB firm test and balance engineer shall conduct the inspection in the presence of Owner.
3. Owner shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

**3.10 ADDITIONAL TESTS**

- A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near-peak summer and winter conditions.

**END OF SECTION 23 0593**

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  1. Division 20 Section "Mechanical General Requirements."
  2. Division 23 Section "Nonmetal Ducts" for fabric ducts, fibrous-glass ducts, thermoset FRP ducts, thermoplastic ducts, PVC ducts, and concrete ducts.
  3. Division 23 Section "HVAC Casings" for factory- and field-fabricated casings for mechanical equipment.
  4. Division 23 Section "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

#### 1.02 SUMMARY

- A. This Section includes metal ducts for supply, return, outside, relief air, and exhaust air-distribution systems.
- B. Products Installed but Not Furnished Under This Section:
  1. Receive, handle, and install terminal boxes furnished by the Laboratory Airflow Controls Contractor. Refer to Division 23 Section "Laboratory Airflow Controls."

**1.03 DEFINITIONS**

- A. Duct Sizes: Inside clear dimensions. For lined ducts, maintain sizes inside lining.
- B. Low Pressure: Up to and including 2 inch WG and velocities less than 1,500 fpm.
- C. Medium Pressure: Greater than 2 inch WG to 6 inch WG and velocities greater than 1,500 fpm and less than 2,500 fpm.
- D. High Pressure: Greater than 6 inch WG to 12 inch WG and velocities greater than 2,500 fpm.
- E. FRP: Fiberglass-reinforced plastic.
- F. PVC: Polyvinyl Chloride.

**1.04 SYSTEM DESCRIPTION**

- A. Duct system design, as indicated, has been used to select size and type of air-moving and -distribution equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

**1.05 PERFORMANCE REQUIREMENTS**

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Application Schedule" Article.

**1.06 ACTION SUBMITTALS**

- A. Shop Drawings: Drawn to scale. Show fabrication and installation details for metal ducts. Shop drawings shall be reviewed and approved by the Architect prior to any fabrication.
  - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
  - 2. Duct layout indicating sizes and pressure classes.
  - 3. Elevations of top and bottom of ducts.
  - 4. Dimensions of main duct runs from building grid lines.
  - 5. Fittings.
  - 6. Reinforcement and spacing.
  - 7. Seam and joint construction.
  - 8. Penetrations through fire-rated and other partitions.
  - 9. Equipment installation based on equipment being used on Project.
  - 10. Duct accessories, including access doors and panels.
  - 11. Hangers and supports, including methods for duct and building attachment, vibration isolation.

**1.07 INFORMATIONAL SUBMITTALS**

- A. Delegated-Design Submittal:
  - 1. Sheet metal thicknesses.
  - 2. Joint and seam construction and sealing.
  - 3. Reinforcement details and spacing.
  - 4. Materials, fabrication, assembly, and spacing of hangers and supports.
- B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Ceiling suspension assembly members.
  - 2. Other systems installed in same space as ducts.
  - 3. Ceiling- and wall-mounting access doors and panels required to provide access to dampers and other operating devices.
  - 4. Ceiling-mounting items, including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

**1.08 CLOSEOUT SUBMITTALS**

- A. Field quality-control test reports.

**1.09 QUALITY ASSURANCE**

- A. NFPA Compliance:
  - 1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
  - 2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Ch. 3, "Duct System," for range hood ducts, unless otherwise indicated.
- C. Duct Liner Maximum Temperature Limits: Based on ASTM C 411 test procedures.

**1.10 COORDINATION**

- A. Sheet metal trades shall cooperate fully with the Laboratory Airflow Controls Trades and shall attend all field installation training sessions.
- B. Sheet metal trades shall cooperate fully with the Test and Balance Contractor and provide all miscellaneous caps and any other materials required for structural integrity and leakage testing of the complete duct system in whole or in part. Refer to Division 23 Section "Testing, Adjusting and Balancing."
  - 1. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
- C. Sheet metal trades shall participate in the above ceiling coordination program. Refer to Division 01 requirements.

**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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

**2.02 SHEET METAL MATERIALS**

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation.
- C. Galvannealed Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation, and annealed after the galvanizing process.
- D. PVC-Coated Galvanized Steel: Acceptable by authorities having jurisdiction for use in fabricating ducts with UL 181, Class 1 listing. Lock-forming-quality, galvanized sheet steel complying with ASTM A 653/A 653M and having G60 coating designation. Factory-applied PVC coatings shall be 4 mils thick on exterior sheet metal surfaces of ducts and fittings exposed to corrosive conditions and minimum 1 mil thick on interior surfaces.
- E. PVC-Coated Galvanized Steel: Acceptable by authorities having jurisdiction for use in fabricating ducts with UL 181, Class 1 listing. Lock-forming-quality, galvanized sheet steel complying with ASTM A 653/A 653M and having G60 coating designation. Factory-applied PVC coatings shall be 4 mils thick on sheet metal surfaces of ducts and fittings exposed to corrosive conditions and 4 mils thick on opposite surfaces.
- F. PVC-Coated Galvanized Steel: Acceptable by authorities having jurisdiction for use in fabricating ducts with UL 181, Class 1 listing. Lock-forming-quality, galvanized sheet steel complying with ASTM A 653/A 653M and having G60 coating designation. Factory-applied PVC coatings shall be 4 mils thick on interior sheet metal surfaces of ducts and fittings exposed to corrosive conditions and minimum 1 mil thick on exterior surfaces.

- G. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, matte finish for exposed ducts.
- H. Stainless Steel: ASTM A 480/A 480M, Type 316, and having a No. 2D finish for concealed ducts and No. 4 for exposed ducts.
- I. Aluminum Sheets: ASTM B 209, alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- J. Reinforcement Shapes and Plates:
  - 1. Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.
  - 2. Compatible materials for aluminum and stainless-steel ducts.
- K. Tie Rods:
  - 1. Galvanized Steel Duct: Galvanized steel, 3/8-inch minimum diameter.
  - 2. Ducts in Humid or Corrosive Atmospheres: Stainless steel, 1/4-inch diameter for lengths 36 inches or less; 3/8-inch diameter for lengths longer than 36 inches.

## 2.03 DUCT LINER

- A. Fibrous-Glass Liner: Comply with NFPA 90A or NFPA 90B and with NAIMA AH124.
  - 1. Manufacturers:
    - a. CertainTeed Corp.; Insulation Group.
    - b. Johns Manville International, Inc.
    - c. Knauf Fiber Glass GmbH.
  - 2. Materials: ASTM C 1071, Type I, flexible; surfaces exposed to airstream shall be coated to prevent erosion of glass fibers.
    - a. Thickness: 1 inch.
    - b. Density: 1-1/2 pounds per cubic foot.
    - c. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
    - d. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
    - e. Maximum Operating Temperature: 250 deg F when tested according to ASTM C 411.
    - f. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
    - g. Mechanical Fasteners: Galvanized steel suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.
      - 1) Tensile Strength: Indefinitely sustain a 50-lb- tensile, dead-load test perpendicular to duct wall.
      - 2) Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch into airstream.
      - 3) Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.
  - 3. Noise reduction coefficient (NRC): Sound absorption coefficients shall not be less than those in the table below as tested by ASTM C423 using an ASTM E795 Type A mounting.

## 2.04 SEALANTS AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Elastomeric Sealant Tape: 3 inches wide; modified butyl adhesive backed.
  - 1. Manufacturers:
    - a. Hardcast; Foil-Grip 1402 and Foil-Grip 1402-181BFX.
- C. Water-Based Joint and Seam Sealant:
  - 1. Manufacturers:
    - a. Design Polymeric; DP1010 Water Based Duct Sealant.
    - b. Hardcast; Flex-Grip 550 and Versa-Grip 181.
    - c. Polymer Adhesives; No. 11.
    - d. United McGill.

2. Application Method: Brush on.
  3. Solids Content: Minimum 63 percent.
  4. Shore A Hardness: Minimum 20.
  5. Water resistant.
  6. Mold and mildew resistant.
  7. VOC: Maximum 75 g/L (less water).
  8. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
  9. Service: Indoor or outdoor.
  10. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- D. Solvent-Based Joint and Seam Sealant:
1. Manufacturers:
    - a. Hardcast; Sure-Grip 404.
    - b. United McGill.
  2. Application Method: Brush on.
  3. Base: Synthetic rubber resin.
  4. Solvent: Toluene and heptane.
  5. Solids Content: Minimum 60 percent.
  6. Shore A Hardness: Minimum 60.
  7. Water resistant.
  8. Mold and mildew resistant.
  9. VOC: Maximum 395 g/L.
  10. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
  11. Service: Indoor or outdoor.
  12. Substrate: Compatible with galvanized sheet steel, stainless steel, or aluminum sheets.
- E. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
  2. Type: S.
  3. Grade: NS.
  4. Class: 25.
  5. Use: O.
- F. Gaskets: Chloroprene elastomer, 40 durometer, 1/8 inch thick, full face, one piece vulcanized or dovetailed at joints.
- G. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- H. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
  2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
  3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

## **2.05 HANGERS AND SUPPORTS**

- A. Building Attachments: Concrete inserts, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
- B. Hanger Materials: Galvanized sheet steel or threaded steel rod.
1. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
  2. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
  3. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."
  4. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials. Attachments for stainless steel and PVC-coated duct shall be stainless steel.
- D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.
3. Supports for Aluminum Ducts: Aluminum support materials unless materials are electrolytically separated from ducts.
- E. Load Rated Cable Suspension System for Noncorrosive Environments: Tested to five times the Safe Working Loads and verified by the SMACNA Testing and Research Institute.
  1. Cable: Aircraft quality 7 x 7 and 7 x 19 wire rope.
    - a. Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
    - b. Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
  2. Fastener: One-piece, die-cast zinc housing with Type 302 S26 stainless steel hardened and tempered springs, and oil impregnated, sintered, hardened and tempered steel locking wedges.
  3. End Fixings: Loop, stud or toggle; or plain end suitable for wire rope beam clamp.
  4. Manufacturers:
    - a. B-Line by Eaton; KwikWire.
    - b. Ductmate Industries, Inc.; Clutcher and EZ-Lock.
    - c. Duro Dyne Corp.; Dyna-Tite System.
    - d. Gripple Inc.; Hang-Fast System.
- F. Stainless Steel Load Rated Cable Suspension System for Corrosive Environments: Tested to five times the Safe Working Loads and verified by the SMACNA Testing and Research Institute.
  1. Cable: Aircraft quality stainless steel 7 x 7 and 7 x 19 wire rope.
    - a. Stainless steel complying with ASTM A 492.
  2. Fastener: One-piece, stainless steel housing with Type 302 S26 stainless steel hardened and tempered springs, and ceramic locking wedges.
  3. End Fixings:
    - a. Loop End: Type 316L/A4 stainless steel.
    - b. Stud or Toggle End: Type 304L/A2 stainless steel.
    - c. Plain end suitable for stainless steel wire rope beam clamp.
  4. Manufacturers:
    - a. B-Line by Eaton; KwikWire.
    - b. Ductmate Industries, Inc.; Clutcher and EZ-Lock.
    - c. Duro Dyne Corp.; Dyna-Tite System.
    - d. Gripple Inc.; Hang-Fast System.
- G. Welded Supports: Structural steel shapes with zinc rich paint. Equivalent, proprietary design, rolled steel structural support systems may be used in lieu of mill rolled structural steel.

## **2.06 RECTANGULAR DUCT FABRICATION**

- A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
  1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
  2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
  3. Internal Tie Rods: As allowed by SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's and SMACNA guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.
  1. Manufacturers:
    - a. Ductmate Industries, Inc.
    - b. Nexus Inc.
    - c. Ward Industries, Inc.

- C. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of nonbraced panel area unless ducts are lined.

## **2.07 APPLICATION OF LINER IN RECTANGULAR DUCTS**

- A. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
- B. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
- C. Butt transverse joints without gaps and coat joint with adhesive.
- D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
- E. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.
- F. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm or greater.
- G. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
- H. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
  - 1. Fan discharges.
  - 2. Intervals of lined duct preceding unlined duct.
  - 3. Upstream edges of transverse joints in ducts where air velocities are greater than 2500 fpm or where indicated.
- I. Where double-wall rectangular duct is indicated:
  - 1. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
    - a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
  - 2. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

## **2.08 ROUND AND FLAT-OVAL DUCT AND FITTING FABRICATION**

- A. Diameter as applied to flat-oval ducts in this Article is the diameter of a round duct with a circumference equal to the perimeter of a given size of flat-oval duct.
- B. Round, Spiral Lock-Seam Ducts: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" or SMACNA "Industrial Duct Construction Standards" as required based on pressure class.
  - 1. Round fittings shall be factory fabricated welded design. Use of field fabricated fittings (welded design) shall only be permitted when factory fabricated fittings are unavailable.
- C. Flat-Oval, Spiral Lock-Seam Ducts: Fabricate supply ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" or SMACNA "Industrial Duct Construction Standards" as required based on pressure class.
  - 1. Flat-oval fittings shall be factory fabricated welded design. Use of field fabricated fittings (welded design) shall only be permitted when factory fabricated fittings are unavailable.
- D. Round, Longitudinal-Seam Ducts: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards-Metal and Flexible."
- E. Flat-Oval, Longitudinal-Seam Ducts: Fabricate supply ducts according to SMACNA's "HVAC Duct Construction Standards-Metal and Flexible." Fabricate ducts with butt-welded longitudinal seams.
- F. Duct Joints:

1. Ducts up to 20 Inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
  2. Ducts 21 to 72 Inches in Diameter: Three-piece, gasketed, flanged joint consisting of two internal flanges with sealant and one external closure band with gasket.
  3. Ducts Larger Than 72 Inches in Diameter: Companion angle flanged joints per SMACNA "HVAC Duct Construction Standards--Metal and Flexible," Figure 3-2.
  4. Bolts and fasteners for galvanized steel duct shall be carbon steel, zinc coated per ASTM A153. Bolts and fasteners for stainless steel and polyvinyl chloride coated steel duct shall be stainless steel.
  5. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.
  6. Flat-Oval Ducts: Prefabricated connection system consisting of two flanges and one synthetic rubber gasket.
- G. Low Pressure Ductwork (plus or minus 2 inches W.G. Static Pressure Class)
1. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible provide single thickness turning vanes.
  2. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.
- H. Medium and High Pressure Ductwork (For Static Pressure Class Greater than plus or minus 2 inches W.G.)
1. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible provide single thickness turning vanes.
  2. Transform duct sizes gradually, not exceeding 15 degrees divergence and 30 degrees convergence.
  3. Fabricate continuously welded medium and high pressure round and oval duct fittings two gauges heavier than duct gauges indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
  4. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.
- I. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal-seam straight ducts.
- J. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.
- K. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows shall be 1-1/2 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:
1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
  2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg:
    - a. Ducts 3 to 36 Inches in Diameter: 0.034 inch.
    - b. Ducts 37 to 50 Inches in Diameter: 0.040 inch.
    - c. Ducts 52 to 60 Inches in Diameter: 0.052 inch.
    - d. Ducts 62 to 84 Inches in Diameter: 0.064 inch.
  3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg:
    - a. Ducts 3 to 26 Inches in Diameter: 0.034 inch.
    - b. Ducts 27 to 50 Inches in Diameter: 0.040 inch.
    - c. Ducts 52 to 60 Inches in Diameter: 0.052 inch.
    - d. Ducts 62 to 84 Inches in Diameter: 0.064 inch.
  4. Flat-Oval Mitered Elbows: Welded construction with same metal thickness as longitudinal-seam flat-oval duct.



5. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems or for material-handling Class A or B exhaust systems and only where space restrictions do not permit using radius elbows. Fabricate with single-thickness turning vanes.
6. Round Elbows 8 Inches and Less in Diameter: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
7. Round Elbows 9 through 14 Inches in Diameter: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees unless space restrictions require mitered elbows. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
8. Round Elbows Larger Than 14 Inches in Diameter and All Flat-Oval Elbows: Fabricate gored elbows unless space restrictions require mitered elbows.
9. Die-Formed Elbows for Sizes through 8 Inches in Diameter and All Pressures 0.040 inch thick with 2-piece welded construction.
10. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.
11. Flat-Oval Elbow Metal Thickness: Same as longitudinal-seam flat-oval duct specified above.
12. Pleated Elbows for Sizes through 14 Inches in Diameter and Pressures through 10-Inch wg: 0.022 inch.
- L. PVC-Coated Elbows and Fittings: Fabricate elbows and fittings as follows:
  1. Round Elbows 4 to 8 Inches in Diameter: Two piece, die stamped, with longitudinal seams spot welded, bonded, and painted with PVC aerosol spray.
  2. Round Elbows 9 to 26 Inches in Diameter: Standing-seam construction.
  3. Round Elbows 28 to 60 Inches in Diameter: Standard gored construction, riveted and bonded.
  4. Other Fittings: Riveted and bonded joints.
  5. Couplings: Slip-joint construction with a minimum 2-inch insertion length.

### **PART 3 - EXECUTION**

#### **3.01 DUCTWORK APPLICATION SCHEDULE**

- A. Ductwork materials and performance requirements are scheduled on the Drawing.

#### **3.02 DUCT INSTALLATION**

- A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
- B. Install round and flat-oval ducts in lengths not less than 12 feet unless interrupted by fittings.
- C. Install ducts with fewest possible joints.
- D. Install fabricated fittings for changes in directions, size, and shape and for connections.
- E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches, with a minimum of 3 screws in each coupling.
- F. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.
- J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
- K. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.

- L. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches.
- N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, and sleeves. Fire and smoke dampers are specified in Division 23 Section "Duct Accessories."
  - 1. Where ducts not having fire dampers, smoke dampers, or combination fire and smoke dampers pass through fire-rated partitions, maintain indicated fire rating. Seal penetrations with firestop materials. Refer to Division 07 Specification Sections for materials and UL classified firestop systems.
- O. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.
- P. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."
  - 1. Intermediate level.

### **3.03 INSTALLATION OF EXPOSED DUCTWORK**

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

### **3.04 DUCT SEALING**

- A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated. Ducts must be properly cleaned and sealed in strict accordance with sealant manufacturer's instructions.
  - 1. Seal Class: Refer to Application Schedule on the Drawings.
  - 2. Seal ducts before external insulation is applied.
  - 3. After pressure testing, remake leaking joints until leakage is equal to or less than maximum allowable. Refer to Application Schedule on the Drawings for allowable leakage rates.

### **3.05 HANGER AND SUPPORT INSTALLATION**

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- C. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- D. Install concrete inserts before placing concrete.

- E. Support ductwork from building structure, not from roof deck, floor slab, pipe, other ducts, or equipment.
- F. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.
- G. Install roof mounted duct supports in accordance with manufacturer's instructions. Provide additional membrane layer or walkpads under support bases as required.
- H. Use load rated cable suspension system for round duct in exposed locations.

**3.06 CONNECTIONS**

- A. Make connections to equipment with flexible connectors according to Division 23 Section "Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

**3.07 PAINTING**

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

**3.08 FIELD QUALITY CONTROL**

- A. Duct System Cleanliness Tests:
  - 1. Visually inspect duct system to ensure that no visible contaminants are present.
- B. Duct system will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

**3.09 START UP**

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing."

**END OF SECTION 23 3113**

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## SECTION 23 3116 - NONMETAL DUCTS

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### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  - 1. Division 20 Section "Mechanical General Requirements."
  - 2. Division 23 Section "Duct Accessories" for dampers, duct-mounting access doors and panels, turning vanes, and flexible ducts.

#### 1.02 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including duct closure, reinforcements, and hangers and supports, shall comply with SMACNA's "Fibrous Glass Duct Construction Standards" and performance requirements and design criteria indicated.
  - 1. Static-Pressure Classes:
    - a. Supply Ducts (except in Mechanical Rooms): 1-inch wg.
    - b. Supply Ducts (Upstream from Air Terminal Units): 2-inch wg.
    - c. Supply Ducts (Downstream from Air Terminal Units): 1-inch wg.
    - d. Supply Ducts (in Mechanical Equipment Rooms): 2-inch wg.
    - e. Return Ducts (Negative Pressure): 1-inch wg.
    - f. Exhaust Ducts (Negative Pressure): 1-inch wg.

#### 1.03 DEFINITIONS

- A. Thermal Conductivity and Apparent Thermal Conductivity (k-Value): As defined in ASTM C 168. In this Section, these values are the result of the formula  $\text{Btu} \times \text{in.} / \text{h} \times \text{sq. ft.} \times \text{deg F}$  at temperature differences specified. Values are expressed as Btu.
  - 1. Example: Apparent Thermal Conductivity (k-Value): 0.26.

#### 1.04 ACTION SUBMITTALS

- A. Product Data: For the following:

1. Fibrous-glass duct materials.
2. Thermoset FRP duct materials.
3. Thermoplastic duct (PVC) materials.

#### **1.05 INFORMATIONAL SUBMITTALS**

- A. Shop Drawings: CAD-generated and drawn to 1/8 inch equals 1 foot scale. Show fabrication and installation details for nonmetal ducts.
  1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
  2. Duct layout indicating sizes and pressure classes.
  3. Elevations of top and bottom of ducts.
  4. Dimensions of main duct runs from building grid lines.
  5. Fittings.
  6. Reinforcements and spacing.
  7. Seam and joint construction.
  8. Penetrations through fire-rated and other partitions.
  9. Equipment installation based on equipment being used on Project.
  10. Duct accessories, including access doors and panels.
  11. Hangers and supports, including methods for duct and building attachment, vibration isolation.
- B. Delegated-Design Submittal:
  1. Duct materials and thicknesses.
  2. Joint and seam construction and sealing.
  3. Reinforcement details and spacing.
- C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  1. Ceiling suspension assembly members.
  2. Other systems installed in same space as ducts.
  3. Ceiling- and wall-mounting access doors and panels required to provide access to dampers and other operating devices.
  4. Ceiling-mounting items, including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- D. Welding certificates.

#### **1.06 CLOSEOUT SUBMITTALS**

- A. Field quality-control reports.

#### **1.07 QUALITY ASSURANCE**

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
  1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
  2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
- B. NFPA Compliance:
  1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
  2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- C. UL Compliance: UL listed and labeled as complying with UL 181.

### **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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

## **2.02 THERMOSET FRP DUCTS**

- A. Manufacturers:
  - 1. ATS, Inc.
  - 2. Monoxivent; Division of Crawford Company.
  - 3. Perry Fiberglass Products, Inc.
  - 4. Primary Plastics, Inc.
  - 5. Spunstrand Inc.
- B. Material: Glass-fiber-reinforced plastic.
- C. Performance Requirements:
  - 1. Structural Wall: Structural layer of duct wall thickness shall be fabricated by either filament wound or hand layup techniques to the dimensional thickness and strength required by ASTM and SMACNA standards.
  - 2. Maximum Operating Static Pressures:
    - a. 10-inch wg positive.
    - b. 10-inch wg negative.
- D. Joining Materials: Roving and polyester resin.
- E. Fabrication:
  - 1. Straight, Rectangular-Duct Seams: Glass tape and resin reinforced.
  - 2. Round Ducts: Molded on mandrel with continuous wound glass filaments.
  - 3. Section and Fitting Connectors: Sleeves or belled ends, and epoxy.
- F. Fitting Fabrication:
  - 1. Round Elbows: Five-piece, mitered construction with centerline radius at least two times the diameter.
  - 2. Rectangular Elbows: Mitered with turning vanes.
  - 3. Branch Connections to Main Ducts: 45 degrees from centerlines of main ducts.
  - 4. Reducers, Round-to-Rectangular Transformations: Minimum taper of 3:1 length change to diameter.
  - 5. Offsets: 45 degrees from centerlines of straight ducts.
- G. Flange Fabrication:
  - 1. Adhered to ducts with epoxy.
  - 2. Fabricated from 1/4-inch- thick FRP at least 2 inches wide.
  - 3. Gaskets: Full face, 1/8 inch thick.
  - 4. Flange Bolts, Nuts, and Washers: 9/32 inch in diameter; Type 316, stainless steel.
- H. Supports and Hangers: Galvanized steel.
  - 1. Vertical Ducts: Structural channels and clamps under 1/2-inch flanges adhered with epoxy to outside of ducts.
  - 2. Horizontal Ducts: Steel split rings and rod hangers.
- I. Drains: Formed drain pockets with 1-inch threaded pipe connections.
- J. Flexible Connectors:
  - 1. Material: Hypalon.
  - 2. Length: 4 inches between both parts to be connected, with enough slack material to prevent vibration transmission when system is in operation.
  - 3. Clamps: Two stainless-steel, gear-drive bands.

## **2.03 THERMOPLASTIC DUCTS (PVC)**

- A. Manufacturers:
  - 1. General Plastics, Inc.
  - 2. GF Piping Systems; George Fischer North America.
  - 3. Primary Plastics, Inc.
  - 4. Spears Manufacturing Company.
- B. Fabricate from non-plasticized, rigid, ASTM D 1784, PVC sheets according to SMACNA's "Thermoplastic Duct (PVC) Construction Manual" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.
- C. Joining Materials: PVC solvent cement complying with ASTM D 2564.
- D. Fabrication:
  - 1. Maximum Operating Static Pressure: 6-inch wg Welding: Hot-gas, filler-rod welding.

2. Form straight ducts with butt-welded longitudinal seams.
3. Heat-form rectangular duct corners.
4. Mold round ducts to shape.
5. Connect sections and fittings with belled ends or by welding sleeves to ducts.
- E. Fitting Fabrication:
  1. Round Elbows: Five-piece, mitered construction with centerline radius at least two times the diameter.
  2. Rectangular Elbows: Mitered with PVC turning vanes.
  3. Branch Connections to Main Ducts: 45 degrees from centerlines of main ducts.
  4. Reducers, Round-to-Rectangular Transformations: Minimum taper of 3:1 length change to diameter.
  5. Offsets: 45 degrees from centerlines of straight ducts.
- F. Flange Fabrication:
  1. Welded to ducts.
  2. Fabricated from 1/4-inch- thick PVC at least 2 inches wide.
  3. Gaskets: Full face, 1/8-inch- thick plasticized PVC.
  4. Flange Bolts, Nuts, and Washers: 9/32 inch in diameter; Type 316, stainless steel.
- G. Supports and Hangers: Galvanized steel.
  1. Vertical Ducts: Structural channels and clamps under 1/2-inch PVC flanges welded to outsides of ducts.
  2. Horizontal Ducts: Steel split rings and rod hangers. Rings shall not compress ducts when closed.
- H. Drains: PVC drain pockets with 1-inch threaded PVC pipe connections.
- I. Flexible Connectors:
  1. Material: Hypalon.
  2. Length: 4 inches between both parts to be connected, with enough slack material to prevent vibration transmission when system is in operation.
  3. Clamps: Two stainless-steel, gear-drive bands.

## **2.04 HDPE UNDERGROUND DUCTS**

- A. Manufacturers:
  1. AQC Industries; Blue Duct.
  2. Simtech Process Systems.
- B. Description: Complete duct system (including: plenums, round duct, run-outs, diffuser boots, etc.) must be from one manufacturer and be of the same material, construction and connection method throughout. Field made duct components are not acceptable.
- C. Construct duct and fittings in accordance with SMACNA's Duct Construction Standards.
- D. Furnish elbows, duct, diffusers, plenum, clamp and gasket, boots, saddle registers and caulk as required by drawings for underground installation.
- E. Material: Ductwork shall be closed cell plastic material that is recyclable, does not emit volatile organic compounds, and conforms to ASTM-D2412.
  1. Ductwork shall be resistant to mildew, mold (UL 181B), and radon gas (BSS 7239-88).
  2. Ductwork shall not rust or crack under external stress or strain.
  3. Ductwork shall have integral R-10 equivalent thermal insulation value, without the use of external insulation, in accordance with NSF's P374 Protocol and verified by NSF Thermal Testing Report.
- F. Joints: Joints shall be sealed via gasket or bolts and sealant.
  1. Clamps and gaskets shall be used on ductwork without flanges.
  2. Clamps shall be polyethylene with stainless steel plates and stainless steel screws.
  3. Gaskets shall comprise of 1/4-inch thick butyl rubber sealant tape that is water and UV resistant and shall not stain.
  4. Gaskets shall comply with ASTM-E84 for flame and smoke spread.
  5. Flanged Joints: Flanged joints and duct branches shall use manufacturer's standard co-polymer adhesive caulking sealant that is water and UV resistant. Flanges shall be connected with stainless steel bolts.
- G. Assembled ductwork shall be able to maintain pressure with no leakage.



- H. Duct system performance shall exceed SMACNA's Leakage Class 3 requirements at the system design static pressure.

## **2.05 HANGERS AND SUPPORTS**

- A. Building Attachments: Concrete inserts, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
- B. Hanger Materials: Galvanized sheet steel or threaded steel rod.
  - 1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
  - 2. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.
  - 3. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials. Attachments for stainless steel and PVC-coated duct shall be stainless steel.
- D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.
  - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
  - 2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.
  - 3. Supports for Aluminum Ducts: Aluminum support materials unless materials are electrolytically separated from ducts.
- E. Load Rated Cable Suspension System: Tested to five times the Safe Working Loads and verified by the SMACNA Testing and Research Institute.
  - 1. Cable: Aircraft quality zinc coated 7 x 7 and 7 x 19 wire rope.
  - 2. Fastener: One-piece, die-cast zinc housing with Type 302 S26 stainless steel hardened and tempered springs, and oil impregnated, sintered, hardened and tempered steel locking wedges.
  - 3. End Fixings: Loop, stud or toggle; or plain end suitable for wire rope beam clamp.
  - 4. Manufacturers:
    - a. Ductmate Industries, Inc.; Clutcher and EZ-Lock.
    - b. Duro Dyne Corp.; Dyna-Tite System.
    - c. Gripple Inc.; Hang-Fast System.
- F. Welded Supports: Structural steel shapes with zinc rich paint. Equivalent, proprietary design rolled steel structural support systems may be used in lieu of mill rolled structural steel.

## **PART 3 EXECUTION**

### **3.01 APPLICATION AND INSTALLATION**

- A. Install nonmetal duct where indicated and as detailed on Drawings.
- B. Install ducts with fewest possible joints.
- C. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.
- D. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- E. Install ducts with a clearance of 1 inch.
- F. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.
- G. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts with sheet metal flanges. Overlap opening on 4 sides by at least 1-1/2 inches.
- H. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers and sleeves. Fire and smoke dampers are specified in Division 23 Section "Duct Accessories."
- I. Install thermoplastic ducts (PVC) and fittings according to SMACNA's "Thermoplastic Duct (PVC) Construction Manual."
- J. Install thermoset FRP ducts and fittings according to NFPA 91.

- K. Install thermoset FRP ducts so that no metals penetrate duct system.
  - 1. Support vertical ducts at every floor and at roof. Support horizontal ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
  - 2. Support exhaust fans, fume hoods, and heavy accessories independent of ducts.
  - 3. Install flexible connectors with enough slack to prevent vibration transmission when fan is in operation.
  - 4. Install and brace rainstack exhaust terminals with stays firmly anchored to roof.
  - 5. Slope exhaust ducts back to fume hoods.
  - 6. Install penetrations through roof with flashing and counterflashing.
- L. Mount accessories according to SMACNA's "Thermoplastic Duct (PVC) Construction Manual." and SMACNA's "Thermoset FRP Duct Construction Manual."
  - 1. Reinforce and support equipment and duct accessories for additional weight without damage to ducts.
  - 2. Install volume-control dampers and operators on same sleeves or mounting plates and allow full 90-degree quadrant movement.
  - 3. Connect ducts to equipment using sheet metal washers and screws or mechanical fasteners attached to flange extensions.
- M. Assemble thermoset FRP ducts according to SMACNA's "Thermoset FRP Duct Construction Manual."
  - 1. Fabricate mitered elbows with turning vanes.
  - 2. Fabricate 90-degree branch connections from supply ducts with volume-control dampers in branch ducts.
  - 3. Install reinforcements according to SMACNA's "Thermoset FRP Duct Construction Manual."
  - 4. Support rigid round and rectangular ducts according to SMACNA's "Thermoset FRP Duct Construction Manual."
- N. Assemble thermoplastic ducts (PVC) according to SMACNA's "Thermoplastic Duct (PVC) Construction Manual."
  - 1. Fabricate mitered elbows with turning vanes.
  - 2. Fabricate 90-degree branch connections from supply ducts with volume-control dampers in branch ducts.
  - 3. Install reinforcements according to SMACNA's "Thermoplastic Duct (PVC) Construction Manual."
  - 4. Support rigid round and rectangular ducts according to SMACNA's "Thermoplastic Duct (PVC) Construction Manual."

### **3.02 HDPE UNDERGROUND DUCTS**

- A. Duct system shall be installed by manufacturer trained installers.

### **3.03 HANGER AND SUPPORT INSTALLATION**

- A. Install hangers and supports for thermoset FRP ducts and fittings to comply with SMACNA's "Thermoset FRP Duct Construction Manual," Chapter 7, "Requirements."
- B. Install hangers and supports for PVC ducts and fittings to comply with SMACNA's "Thermoplastic Duct (PVC) Construction Manual," Chapter 3, "Standards of Construction for PVC Duct Systems."
- C. Duct Attachments: Support horizontal ducts with trapeze-type hangers.
- D. Hangers: Suspend duct attachments from building attachments with one of the following hanger types:
  - 1. Galvanized sheet metal strips, a minimum of 0.034 by 1 inch wide.
  - 2. Galvanized-steel rods, 1/4 inch in diameter, threaded along entire length.
  - 3. Load rated cable suspension system.
- E. Attach hangers to joints and reinforcing channels that occur within required hanger spacing. Attach hangers to transmit load to sides and bottom channels and no more than 6 inches from sides of ducts.
- F. Support equipment and metal duct components and accessories independent of ducts.
- G. Support terminal components separately.

- H. Install sheet metal sleeves to support dampers. For motorized dampers, extend sleeves to support operators.
- I. Install concrete inserts before placing concrete.
- J. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

**3.04 PAINTING**

- A. Paint interior of thermoset FRP and PVC ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

**3.05 FIELD QUALITY CONTROL**

- A. Perform tests and inspections.
- B. Duct System Cleanliness Tests:
  - 1. Visually inspect duct system to ensure that no visible contaminants are present.
- C. Duct system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

**3.06 START UP**

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing."

**END OF SECTION 23 3116**

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  - 1. Division 20 Section "Mechanical General Requirements."
  - 2. Division 23 Section "Testing, Adjusting, and Balancing" for duct test holes.
  - 3. Division 23 Section "Temperature Controls" for motorized control dampers.
  - 4. Division 28 Section "Fire Alarm" for duct-mounting fire and smoke detectors.

#### 1.02 DEFINITIONS

- A. NVLAP: National Voluntary Laboratory Accreditation Program.
- B. Low Pressure: Up to 2 inch WG and velocities less than 1,500 fpm. Construct for 2 inch WG positive or negative static pressure.
- C. Medium Pressure: Greater than 2 inch WG to 6 inch WG and velocities greater than 1,500 fpm and less than 2,500 fpm. Construct for 6 inch WG positive or negative static pressure.
- D. High Pressure: Greater than 6 inch WG to 12 inch WG and velocities greater than 2,500 fpm. Construct for 12 inch WG positive or negative static pressure.

#### 1.03 INFORMATIONAL SUBMITTALS

- A. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
  - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
    - a. Special fittings.

- b. Manual volume damper installations.
  - c. Control damper installations.
  - d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
  - e. Duct security bars.
  - f. Wiring Diagrams: Power, signal, and control wiring.
- B. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinating penetrations and ceiling-mounting items. Show ceiling-mounting access panels and access doors required for access to duct accessories.
- C. Source quality-control reports.

#### **1.04 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

#### **1.05 QUALITY ASSURANCE**

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

#### **1.06 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Fusible Links: Furnish quantity equal to 10 percent of amount installed for each temperature rating.

### **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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

#### **2.02 SHEET METAL MATERIALS**

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.
- B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation.
- C. Stainless Steel: ASTM A 480/A 480M, Types 304 and 316 as indicated.
- D. Extruded Aluminum: ASTM B 221, alloy 6063, temper T6.
- E. Bird Screens: No. 2 mesh, 0.063 inch diameter galvanized wire screen with open area of not less than 72 percent. Conceal sharp edges by adding metal edging consisting of rod, flat or angle iron, or 16 gage galvanized sheet steel turned over at least 3/4 inch on both sides.

#### **2.03 LOW PRESSURE MANUAL VOLUME DAMPERS**

- A. Manufacturers:
  - 1. American Warming and Ventilating; Mestek, Inc.
  - 2. Arrow United Industries; Mestek, Inc.
  - 3. Greenheck Fan Corporation.
  - 4. Krueger-HVAC; Air Distribution Technologies, Inc.; a JCI Company.
  - 5. Louvers and Dampers, Inc.; Mestek, Inc.
  - 6. Nailor Industries Inc.

7. Ruskin Company.
8. Vent Products Co., Inc.
9. Young Regulator Co.
- B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
  1. Except for dampers in round ductwork sized 12 inches and smaller, provide end bearings.
- C. Rectangular Volume Dampers: Multiple-opposed-blade design, AMCA certified for maximum leakage of 2 percent of total fan volume at shutoff, and suitable for horizontal or vertical applications.
- D. Round Volume Dampers 16-inch Diameter and Smaller: Single-blade design, AMCA certified for maximum leakage of 2 percent of total fan volume at shutoff, and suitable for horizontal or vertical applications.
- E. Round Volume Dampers Larger than 16-inch Diameter: Multiple-opposed-blade design AMCA certified for maximum leakage of 2 percent of total fan volume at shutoff, and suitable for horizontal or vertical applications.
- F. Damper Materials:
  1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
  2. Roll-Formed Steel Blades: 0.064-inch- thick, galvanized sheet steel.
  3. Blade Axles: Galvanized steel.
  4. Bearings: Oil-impregnated bronze, molded synthetic, or stainless-steel sleeve type.
  5. Tie Bars and Brackets: Galvanized steel.
- G. Jackshaft: 1-inch- diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
  1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.
- H. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

## **2.04 MEDIUM OR HIGH PRESSURE MANUAL VOLUME DAMPERS**

- A. Manufacturers:
  1. American Warming and Ventilating; Mestek, Inc.
  2. Greenheck Fan Corporation.
  3. Louvers and Dampers, Inc.; Mestek, Inc.
  4. Nailor Industries Inc.
  5. Ruskin Company.
  6. Vent Products Co., Inc.
- B. General Description: Factory fabricated, galvanized steel or extruded aluminum construction, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
- C. Rectangular Volume Dampers: Multiple-opposed-blade design, AMCA certified for maximum leakage of 2 percent of total fan volume at shutoff, and suitable for horizontal or vertical applications. Construction and assembly such that no noise producing blade vibration occurs at velocities 20 percent greater than maximum system design velocity.
- D. Round Volume Dampers 16-inch Diameter and Smaller: Single-blade, or multiple-opposed-blade design, AMCA certified for maximum leakage of 2 percent of total fan volume at shutoff, and suitable for horizontal or vertical applications. Construction and assembly such that no noise producing blade vibration occurs at velocities 20 percent greater than maximum system design velocity.
- E. Round Volume Dampers Larger than 16-inch Diameter: Multiple-opposed-blade design, AMCA certified for maximum leakage of 2 percent of total fan volume at shutoff, and suitable for

horizontal or vertical applications. Construction and assembly such that no noise producing blade vibration occurs at velocities 20 percent greater than maximum system design velocity.

F. Damper Materials:

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- thick, galvanized sheet steel.
3. Aluminum Frames: Hat-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
4. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.
5. Blade Axles: Galvanized steel or stainless steel.
6. Bearings: Oil-impregnated bronze, molded synthetic, or stainless-steel sleeve type.
7. Tie Bars and Brackets: Aluminum or galvanized steel.

G. Jackshaft: 1-inch- diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.

H. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

## 2.05 MOTORIZED CONTROL DAMPERS

A. Refer to Division 23 Section "Temperature Controls."

## 2.06 TURNING VANES

A. Manufactured Turning Vanes:

1. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.
2. Double-vane or airfoil-shaped, curved blades of galvanized sheet steel set into vane runners suitable for duct mounting.
3. Generated sound power level shall not exceed 54 decibels in octave band 4 at 2000 fpm in a 24-inch by 24-inch duct.
4. Manufacturers:
  - a. Aero-Dyne Sound Control; H-E-P Turning Vanes & Rail.
  - b. Ductmate Industries, Inc.
  - c. Duro Dyne Corporation.
  - d. Ward Industries, Inc.; a JCI Company.

B. Manufactured Acoustic Turning Vanes:

1. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.
2. Double-vane curved blades of galvanized sheet steel with perforated faces and fibrous-glass fill set into vane runners suitable for duct mounting.
3. Manufacturers:
  - a. Ductmate Industries, Inc.
  - b. Ward Industries, Inc.; a JCI Company.

## 2.07 DUCT-MOUNTING ACCESS DOORS

A. General Description: Fabricate doors airtight and suitable for duct pressure class. Doors may be field fabricated in accordance with SMACNA Standards, or commercially produced.

B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.

1. Manufacturers:
  - a. Air Balance, Inc.; Mestek, Inc.



- b. Greenheck Gan Corporation.
    - c. Nailor Industries Inc.
    - d. Ruskin Company.
  - 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
  - 3. Provide number of hinges and locks as follows:
    - a. Less Than 12 Inches Square: Secure with two sash locks.
    - b. Up to 18 Inches Square: Two hinges and two compression locks.
    - c. Up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
    - d. Sizes 24 by 48 Inches and Larger: One additional hinge.
- C. Door: Double wall, duct mounting, and round; fabricated of galvanized sheet metal with insulation fill and 1-inch thickness. Include cam latches.
  - 1. Manufacturers:
    - a. Ductmate Industries, Inc.
    - b. Flexmaster U.S.A.; a Masterduct Company.
  - 2. Frame: Galvanized sheet steel, with spin-in notched frame.
- D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
- E. Insulation: 1-inch-thick, fibrous-glass or polystyrene-foam board.

## **2.08 FLEXIBLE CONNECTORS**

- A. Manufacturers:
  - 1. ADSCO Manufacturing LLC.
  - 2. Duro Dyne Corp.
  - 3. Senior Flexonics Pathway.
  - 4. Ventfabrics, Inc.
- B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- C. Metal-Edged Connectors: Factory fabricated with a fabric strip minimum 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Select metal compatible with ducts.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
  - 1. Minimum Weight: 26 oz./sq. yd.
  - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
  - 3. Service Temperature: Minus 20 to plus 200 deg F.
- E. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
  - 1. Minimum Weight: 24 oz./sq. yd.
  - 2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
  - 3. Service Temperature: Minus 50 to plus 250 deg F.
- F. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.
  - 1. Minimum Weight: 16 oz./sq. yd.
  - 2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
  - 3. Service Temperature: Minus 67 to plus 500 deg F.
- G. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.
  - 1. Minimum Weight: 14 oz./sq. yd.
  - 2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.
  - 3. Service Temperature: Minus 67 to plus 500 deg F.

## **2.09 FLEXIBLE DUCTS, LOW AND MEDIUM PRESSURE**

- A. Manufacturers:
  - 1. Flexmaster U.S.A.; a Masterduct Company; Type 1M Acoustical.
  - 2. Hart & Cooley.
  - 3. Thermaflex; part of the Flexible Technologies Group.

- B. Flexible Ducts: Interlocking spiral of galvanized steel or aluminum construction or fabric supported by helically wound spring steel wire or flat steel bands; rated to 6 inches WG positive and 4 inches WG negative for low and medium pressure ducts.
- C. Insulated Flexible Ducts: UL 181, Class 1, flexible duct wrapped with flexible glass fiber insulation, enclosed by a fire retardant polyethylene vapor barrier jacket; maximum 0.23 K value at 75 deg F.
- D. Acoustical performance tested in accordance with the Air Diffusion Council's *Flexible Air Duct Test Code FD 72-R1, Section 3.0, Sound Properties* shall be as follows:  
The insertion loss (dB) of a 10 foot length of straight duct when tested in accordance with ASTM E477, at a velocity of 2500 feet per minute, shall be minimum:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	8	32	38	35	39	25
8" diameter	13	32	36	35	36	21
12" diameter	15	29	28	33	26	14

The radiated noise reduction (dB) of a 10 foot length of straight duct when tested in accordance with ASTM E477, at a velocity of 2500 feet per minute, shall be minimum:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	6	8	7	8	9	13
8" diameter	9	6	6	7	8	10
12" diameter	9	7	6	6	8	11

The self-generated sound power levels (LW) dB are 10-12 Watt of a 10 foot length of straight duct for an empty sheet metal duct when tested in accordance with ASTM E477, at a velocity of 1000 feet per minute, shall not exceed:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	42	31	23	18	17	21
8" diameter	41	34	27	19	18	21
12" diameter	53	44	36	27	21	22

- E. Flexible Duct Fittings: Galvanized steel, twist-in design with damper. Size as indicated.
- F. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 through 18 inches to suit duct size.

## 2.10 FLEXIBLE DUCTS HIGH PRESSURE

- A. Manufacturers:
  - 1. Flexmaster U.S.A.; a Masterduct Company; Type 3M.
  - 2. Hart & Cooley.
  - 3. Thermaflex; part of the Flexible Technologies Group.
- B. Flexible Ducts: Interlocking spiral of galvanized steel or aluminum construction or fabric supported by helically wound spring steel wire or flat steel bands; rated to 12 inches WG positive and 4 inches WG negative for medium and high pressure ducts.
- C. Insulated Flexible Ducts: UL 181, Class 1, flexible duct wrapped with flexible glass fiber insulation, enclosed by seamless aluminum pigmented plastic vapor barrier jacket; maximum 0.23 K value at 75 deg F.
- D. Flexible Duct Fittings: Galvanized steel, twisted-in design with damper. Size as indicated.
- E. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 through 18 inches to suit duct size.

## 2.11 FLEXIBLE DUCT ELBOW SUPPORTS

- A. Manufacturer:
  - 1. Titus; Air Distribution Technologies, Inc.; a JCI Company; FlexRight.
  - 2. Thermaflex; part of the Flexible Technologies Group; FlexFlow Elbow.
  - 3. Hart and Cooley, Inc.; Smart Flow Elbow.
- B. Elbow supports shall be constructed of durable composite material and be fully adjustable to support flexible duct diameters 6 inches through 16 inches.
- C. Elbow supports shall be UL listed for use in return air plenum spaces.

## **2.12 DUCT ACCESSORY HARDWARE**

- A. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

## **PART 3 - EXECUTION**

### **3.01 APPLICATION AND INSTALLATION**

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts and PVC coated ducts; and aluminum accessories in aluminum ducts.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
  - 1. Install steel volume dampers in steel ducts.
  - 2. Install stainless steel volume dampers in stainless steel ducts.
  - 3. Install aluminum volume dampers in aluminum ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install duct access doors on ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
  - 1. On upstream side of duct coils.
  - 2. On downstream side of air duct coils.
  - 3. Upstream from duct filters.
  - 4. At outdoor-air intakes and mixed-air plenums.
  - 5. At drain pans.
  - 6. Downstream from control dampers, backdraft dampers, and duct mounted equipment.
  - 7. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links.
  - 8. Control devices requiring inspection, including airflow measuring devices. Size access doors appropriately to facilitate service of each device.
  - 9. Elsewhere as indicated.
- F. Install access doors with swing against duct static pressure.
- G. Install duct-mounting, rectangular access doors with long dimension at right angles to direction of airflow and of largest standard size which can be accommodated in duct. Maximum size: 21 by 14 inches.
- H. Install pressure relief doors vertically and level in accordance with manufacturer's instructions, between the fan and first operable damper.
- I. Label access doors according to Division 20 Section "Mechanical Identification."
- J. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.
- K. For fans developing static pressures of 5-inch wg and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- L. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- M. Connect diffusers or light troffer boots to low pressure ducts flexible duct clamped or strapped in place.
- N. Connect flexible ducts to metal ducts with plenum-rated draw bands.

**3.02 FIELD QUALITY CONTROL**

- A. Tests and Inspections:
1. Operate dampers to verify full range of movement.
  2. Inspect locations of access doors and verify that purpose of access door can be performed.
  3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
  4. Inspect turning vanes for proper and secure installation.
  5. Operate remote damper operators to verify full range of movement of operator and damper.

**3.03 ADJUSTING**

- A. Adjust duct accessories for proper settings.
- B. Adjust fire dampers, combination fire and smoke dampers, and smoke dampers for proper action.
- C. Final positioning of manual-volume dampers is specified in Division 23 Section "Testing, Adjusting, and Balancing."

**END OF SECTION 23 3300**

## **SECTION 23 3713 - DIFFUSERS, REGISTERS, AND GRILLES**

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### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  - 1. Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
  - 2. Division 20 Section "Mechanical General Requirements."
  - 3. Division 23 Section "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

#### **1.02 ACTION SUBMITTALS**

- A. Product Data: For each product indicated, include the following:
  - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
  - 2. Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.

### **PART 2 - PRODUCTS**

#### **2.01 AIR DIFFUSION DEVICES**

- A. Manufacturers: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
  - 1. Krueger-HVAC; Air Distribution Technologies, Inc.; a JCI Company.
  - 2. Nailor Industries, Inc.
  - 3. Price Industries.
  - 4. Titus; Air Distribution Technologies, Inc.; a JCI Company.
  - 5. Tuttle & Bailey; Air Distribution Technologies, Inc.; a JCI Company.
- B. Terminal air diffusion devices have been chosen in terms of specific air distribution requirements, spacing, and sound characteristics.
- C. Provide plaster frames for units installed in plaster ceilings.
- D. Provide gaskets for supply terminal air devices mounted in finished surfaces.
- E. Finish:
  - 1. Device Face and Visible Trim: Standard off white baked enamel finish unless noted otherwise.
  - 2. Device Interior Surfaces, Including Blank-Offs and Boots: Black matte finish.
- F. Air pattern adjustments shall be made from the face of the device.
- G. Refer to drawings and schedules for quantities, types, and finishes.
- H. Coordinate frame types with Architectural Reflected Ceiling Plan.

**2.02 SOURCE QUALITY CONTROL**

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."
- B. Acoustical Applications and Sound Evaluation: Based on ARI Standard 885-98, "Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets."

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.02 INSTALLATION**

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Wall-Mounted Supply Registers: Install 6 inches below finished ceiling unless otherwise indicated.
- D. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

**3.03 ADJUSTING**

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

**END OF SECTION 23 3713**

## SECTION 26 0010 - ELECTRICAL GENERAL REQUIREMENTS

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### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

#### 1.02 SUMMARY

- A. This Section includes electrical general administrative and procedural requirements. The following requirements are included in this Section to supplement the requirements specified in Division 1 Specification Sections.
- B. Mechanical and Electrical Specifications have been developed utilizing Construction Specifications Institute MasterFormat and make use of the Facilities Services Subgroup - Divisions 20-28; Site and Infrastructure Subgroup - Division 33; and Process Equipment Subgroup - Divisions 40 and 42.
- C. Division 1 Documents and Architectural Specifications in Divisions 2 through 14 have been developed in the MasterFormat 95 Edition and utilize Division 1 through Division 14.
- D. Where Division 15 Mechanical or Division 16 Electrical are referenced in Division 1 Documents, or within the Architectural Specifications in Divisions 2 through 14, they should refer to Division 20-28, 33, 40, and 42. For additional cross reference information refer to the Construction Specifications Institute.

### 1.03 REFERENCES

- A. All materials shall be new. The electrical and physical properties of all materials, and the design, performance characteristics, and methods of construction of all items of equipment, shall be in accordance with the latest issue of the various, applicable Standard Specifications of the following recognized authorities:
1. ANSI - American National Standards Institute; [www.ansi.org](http://www.ansi.org).
  2. ASTM - ASTM International; [www.astm.org](http://www.astm.org).
  3. CSI - Construction Specifications Institute (The); [www.csiresources.org](http://www.csiresources.org).
  4. ICEA - Insulated Cable Engineers Association, Inc.; [www.icea.net](http://www.icea.net).
  5. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); [www.ieee.org](http://www.ieee.org).
  6. NEC - National Electrical Code
  7. NECA - National Electrical Contractors Association; [www.necanet.org](http://www.necanet.org).
    - a. NECA 1-2000, "Practices for Good Workmanship in Electrical Contracting (ANSI)."
  8. NEMA - National Electrical Manufacturers Association; [www.nema.org](http://www.nema.org).
  9. NETA - InterNational Electrical Testing Association; [www.netaworld.org](http://www.netaworld.org).
  10. UL - Underwriters Laboratories Inc.; [www.ul.com](http://www.ul.com).

### 1.04 QUALITY ASSURANCE

- A. Scope of Work: Furnish all labor, material, equipment, technical supervision, and incidental services required to complete, test and leave ready for operation the electrical systems as specified in the Division 26 Sections and as indicated on Drawings.
1. Contract Documents are complimentary, and what is required by one shall be as binding as if required by all. In the event of inconsistencies or disagreements within the Construction Documents bids shall be based on the most expensive combination of quality and quantity of the work indicated.
  2. The Contractor understands that the work herein described shall be complete in every detail.
- B. Ordinances and Codes: Perform all Work in accordance with applicable Federal, State and local ordinances and regulations, the Rules and Regulations of NFPA, NECA, and UL, unless otherwise indicated.
1. Notify the Architect/Engineer before submitting a proposal should any changes in Drawings or Specifications be required to conform to the above codes, rules or regulations. After entering into Contract, make all changes required to conform to above ordinances, rules and regulations without additional expense to the Owner.
- C. Source Limitations: All equipment of the same or similar systems shall be by the same manufacturer.
- D. Tests and Inspections: Perform all tests required by state, city, county and/or other agencies having jurisdiction. Provide all materials, equipment, etc., and labor required for tests.
- E. Performance Requirements: Perform all work in a first class and workmanlike manner, in accordance with the latest accepted standards and practices for the trades involved.
- F. Sequence and Schedule: Work so as to avoid interference with the work of other trades. Be responsible for removing and relocating any work which in the opinion of the Owner's Representatives causes interference.

### 1.05 CODES, PERMITS AND FEES

- A. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for electrical work shall be secured and paid for by the Contractor. All work shall conform to all applicable codes, rules and regulations.
- B. Rules of local utility companies shall be complied with. Coordinate with the utility company supplying service to the installation and determine all devices including, but not limited to, all current and potential transformers, meter boxes, C.T. cabinets and meters which will be required and include the cost of all such items and all utilities costs in proposal.
- C. All work shall be executed in accordance with the rules and regulations set forth in local and state codes. Prepare any detailed Drawings or diagrams which may be required by the governing



authorities. Where the Drawings and/or Specifications indicate materials or construction in excess of code requirements, the Drawings and/or Specifications shall govern.

**1.06 DRAWINGS**

- A. The Drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
- B. Examine the Drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.
- C. Deviations from the Drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect/Engineer.
- D. The architectural and structural Drawings take precedence in all matters pertaining to the building structure, mechanical Drawings in all matters pertaining to mechanical trades and electrical Drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the Drawings for the various trades, report such conflicts or differences to the Architect/Engineer for resolution.
- E. Drawings are not intended to be scaled for rough-in or to serve as shop drawings. Take all field measurements required to complete the Work.

**1.07 MATERIAL AND EQUIPMENT MANUFACTURERS**

- A. All items of equipment shall be furnished complete with all accessories normally supplied with the catalog items listed and all other accessories necessary for a complete and satisfactory operating system. All equipment and materials shall be new and shall be standard products of manufacturers regularly engaged in the production of electrical equipment and shall be of the manufacturer's latest design.
- B. If an approved manufacturer is other than the manufacturer used as the basis for design, the equipment or product provided shall be equal in size, quality, durability, appearance, capacity, and efficiency through all ranges of operation, shall conform with arrangements and space limitations of the equipment shown on the plans and/or specified, shall be compatible with the other components of the system and shall comply with the requirements for Items Requiring Prior Approval specified in this section of the Specifications. All costs to make these items of equipment comply with these requirements including, but not limited to, electrical work, and building alterations shall be included in the original Bid. Similar equipment shall be by one manufacturer.
- C. Where existing equipment is modified to include new switches, circuit breakers, metering or other components, the new components shall be by the original equipment manufacturer and shall be listed for installation in the existing equipment. Where original equipment manufacturer components are not available, third party aftermarket components shall be listed for the application and submitted to the engineer for approval. Reconditioned or salvaged components shall not be used unless specifically indicated on the drawings.

**1.08 INSPECTION OF SITE**

- A. Visit the site, examine and verify the conditions under which the Work must be conducted before submitting Proposal. The submitting of a Proposal implies that the Contractor has visited the site and understands the conditions under which the Work must be conducted. No additional charges will be allowed because of failure to make this examination or to include all materials and labor to complete the Work.

**1.09 ITEMS REQUIRING PRIOR APPROVAL**

- A. Bids shall be based upon manufactured equipment specified. All items that the Contractor proposes to use in the Work that are not specifically named in the Contract Documents must be submitted for review prior to bids. Such items must be submitted in compliance with Division 1 specifications. Requests for prior approval must be accompanied by complete catalog information, including but not limited to, model, size, accessories, complete electrical information and performance data in the form given in the equipment schedule on the drawings at stated

design conditions. Where items are referred to by symbolic designations on the drawings, all requests for prior approval shall bear the same designations.

1. Equipment to be considered for prior approval shall be equal in quality, durability, appearance, capacity and efficiency through all ranges of operation, shall fulfill the requirements of equipment arrangement and space limitations of the equipment shown on the plans and/or specified and shall be compatible with the other components of the system.
  2. All costs incurred to make equipment comply with other requirements, including providing maintenance, clearance, electrical, replacement of other components, and building alterations shall be included in the original bid.
- B. Voluntary alternates may be submitted for consideration, with listed addition or deduction to the bid.

#### **1.10 SHOP DRAWINGS/SUBMITTALS**

- A. Submit project-specific submittals for review in compliance with Division 1.
- B. All shop Drawings shall be submitted in groupings of similar and/or related items (lighting fixtures, switchgear, etc.). Incomplete submittal groupings will be returned unchecked.
- C. Provide detailed layout shop Drawings on electronic media of all lighting and power distribution systems, routing of conduits, combining of circuits, circuiting, details and related information necessary of installation and maintenance. After review by the Architect/Engineer, an electronic Drawings will be stamped and returned to the Contractor.
- D. If deviations (not substitutions) from Contract Documents are deemed necessary by the Contractor, details of such deviations, including changes in related portions of the project and the reasons therefore, shall be submitted with the submittal for approval.
- E. Submit for approval shop drawings for electrical systems or equipment indicated in other sections of electrical specs. Where items are referred to by symbolic designation on the Drawings and Specifications, all submittals shall bear the same designation (light fixtures).

#### **1.11 COORDINATION DRAWINGS**

- A. Submit project specific coordination drawings for review in compliance with Division 1 Specification Sections.

#### **1.12 OPERATION AND MAINTENANCE INSTRUCTIONAL MANUALS**

- A. Submit project specific Operation and Maintenance Instructional Manuals for review in compliance with Division 01 Specification Sections.
- B. Provide complete operation and maintenance instructional manuals covering all electrical equipment herein specified, together with parts lists. Maintenance and operating instructional manuals shall be job specific to this project. Generic manuals are not acceptable. Manual shall be provided on electronic media. All literature shall be combined in one document and shall be properly bookmarked with all applicable sections. Maintenance and operating instructional manuals shall be provided when construction is approximately 75% complete.
- C. The operating and maintenance instructions shall include a brief, general description for all electrical systems including, but not limited to:
  1. Routine maintenance procedures.
  2. Trouble-shooting procedures.
  3. Contractor's telephone numbers for warranty repair service.
  4. Submittals.
  5. Recommended spare parts list.
  6. Names and telephone numbers of major material suppliers and subcontractors.
  7. System schematic drawings on 8-1/2" x 11" sheets.

#### **1.13 RECORD DRAWINGS**

- A. Submit record drawings in compliance with Division 01.
- B. Contractor shall submit to the Architect/Engineer, record drawings on electronic media which have been neatly marked to represent as-built conditions for all new electrical work. Modifications

to original drawings shall be clearly marked with a contrasting color so the marks are readily apparent.

- C. The Contractor shall keep accurate note of all deviations from the construction documents and discrepancies in the underground concealed conditions and other items of construction on field drawings as they occur. The marked up field documents shall be available for review by the Architect, Engineer and Owner at their request during the course of construction.

#### **1.14 INSTRUCTION OF OWNER PERSONNEL**

- A. Before final inspection, instruct Owner's designated personnel in operation, adjustment, and maintenance of electrical equipment and systems at agreed upon times. A minimum of 8 hours of formal instruction to Owner's personnel shall be provided for each building. Additional hours are specified in individual specification sections.
- B. Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- C. In addition to individual equipment training provide overview of each electrical system. Utilize the as-built documents for this overview.
- D. Prepare and insert additional data in operation and maintenance manual when need for such data becomes apparent during instruction, or as requested by Owner.

#### **1.15 WARRANTY**

- A. Warranty: Comply with the requirements in Division 01 Specification Sections. Contractor shall warranty that the electrical installation is free from defects and agrees to replace or repair, to the Owner's satisfaction, any part of this electrical installation which becomes defective within a period of one year (unless specified otherwise in other Division 26 sections) from the date of substantial completion following final acceptance, provided that such failure is due to defects in the equipment, material, workmanship or failure to follow the contract documents.
- B. Contractor shall be responsible for any temporary services including equipment and installation required to maintain operation as a result of any equipment failure or defect during warranty period.
- C. File with the Owner any and all warranties from the equipment manufacturers including the operating conditions and performance capacities they are based on.

#### **1.16 USE OF EQUIPMENT**

- A. The use of any equipment, or any part thereof for purposes other than testing even with the Owner's consent, shall not be construed to be an acceptance of the work on the part of the Owner, nor be construed to obligate the Owner in any way to accept improper work or defective materials.
- B. Do not use Owner's lamps for temporary lighting except as allowed and directed by the Owner. Equip lighting fixtures with new lamps when the project is turned over to the Owner.

#### **1.17 COORDINATION**

- A. Coordinate arrangement, mounting, and support of electrical equipment:
  - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. To allow right of way for piping and conduit installed at required slope.
  - 4. To ensure that connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions; and to maintain the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 8 Section "Access Doors and Frames."

- D. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.

## **PART 2 PRODUCTS (NOT APPLICABLE)**

## **PART 3 EXECUTION**

### **3.01 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION**

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to raceways and piping systems installed at a required slope.

### **3.02 DEMOLITION WORK**

- A. All demolition of existing electrical equipment and materials will be done by this Contractor unless otherwise indicated. Include all items such as, but not limited to, electrical equipment, devices, lighting fixtures, conduit, and wiring called out on the Drawings and as necessary whether such items are actually indicated on the Drawings or not in order to accomplish the installation of the specified new work.
- B. In general, demolition work is indicated on the Drawings. However, the Contractor shall visit the job site to determine the full extent and character of this work.
- C. Unless specifically noted to the contrary, removed materials shall not be reused in the work. Salvaged materials that are to be reused shall be stored safe against damage and turned over to the appropriate trade for reuse. Salvaged materials of value that are not to be reused shall remain the property of the Owner unless such ownership is waived. Items on which the Owner waives ownership shall become the property of the Contractor, who shall remove and legally dispose of same, away from the premises.
- D. Where equipment or fixtures are removed, outlets shall be properly blanked off, and conduits capped. After alterations are done, the entire installation shall present a "finished" look, as approved by the Architect/Engineer. The original function of the present electrical work to be modified shall not be changed unless required by the specific revisions to the system as specified or as indicated.
- E. Reroute signal wires, lighting and power wiring as required to maintain service. Where walls and ceilings are to be removed as shown on the Drawings, the conduit is to be cut off by the Electrical Trades so that the abandoned conduit in these walls and ceilings may be removed with the walls and ceilings by the Architectural Trades. All dead-end conduit runs shall be plugged at the remaining line outlet boxes or at the panels.
- F. Where new walls and/or floors are installed which interfere with existing outlets, devices, etc., the Electrical Trades shall adjust, extend and reconnect such items as required to maintain continuity of same.
- G. All electrical work in altered and unaltered areas shall be run concealed wherever possible. Use of surface raceway or exposed conduits will be permitted only where approved by the Architect/Engineer.
- H. Existing lighting shall be reused where indicated on plans. Reused fixtures shall be detergent cleaned, relamped and reconditioned suitable for satisfactory operation and appearance.

### **3.03 INSTALLATION OF EQUIPMENT**

- A. Install all equipment in strict accordance with all directions and recommendations furnished by the manufacturer. Where such directions are in conflict with the Drawings and Specifications, report such conflicts to the Architect/Engineer for resolution.
- B. Device Location:
  - 1. Allow for relocation prior to installation of wiring devices and other control devices, for example, receptacles, switches, fire alarm devices, and access control devices, within a 10-foot radius of indicated location without additional cost.

### **3.04 WORK IN EXISTING BUILDINGS**

- A. The Owner will provide access to existing buildings as required. Access requirements to occupied buildings shall be identified on the project schedule. The Contractor, once Work is started in the existing building, shall complete same without interruption so as to return work areas as soon as possible to Owner.
- B. Adequately protect and preserve all existing and newly installed Work. Promptly repair any damage to same at Contractor's expense.
- C. Consult with the Owner's Representative as to the methods of carrying on the Work so as not to interfere with the Owner's operation any more than absolutely necessary. Accordingly, all service lines shall be kept in operation as long as possible and the services shall only be interrupted at such time as will be designated by the Owner's Representative.
- D. Prior to starting work in any area, obtain approval for doing so from a qualified representative of the Owner who is designated and authorized by the Owner to perform testing and abatement of all hazardous materials including but not limited to, asbestos. The Contractor shall not perform any inspection, testing, containment, removal or other work that is related in any way whatsoever to hazardous materials under the Contract.

### **3.05 DISPOSAL**

- A. Fluorescent Lamps
  - 1. Fluorescent lamps are known to contain mercury and are classified as hazardous material. All fluorescent lamps shall be assumed to contain mercury unless tested and confirmed otherwise with a toxicity characteristic leaching procedure (TCLP).
  - 2. Hazardous materials (fluorescent lamps), shall be sent to a lamp recycling facility. The materials shall be properly packaged with labels that meet the Department of Transportation Regulations and stored in a secure location prior to transportation.
  - 3. The Contractor shall identify the costs of the lamp disposal process including, but not limited to, the lamp packaging, storage, transportation, disposal, and any profile fees.
  - 4. At the completion of the project, provide documentation to verify that the lamps have been properly disposed of in accordance with all local, state and federal guidelines.
- B. Ballasts
  - 1. Lighting ballasts manufactured prior to 1979 have been known to contain polychlorinated biphenyls (PCBs). Unless specifically noted on the ballast as containing "No PCBs," the ballast shall be assumed to contain components with PCB materials.
  - 2. Hazardous materials (ballasts with PCBs), shall be disposed of at a hazardous waste incineration facility, or at a recycling facility in accordance with the Code of Federal Regulations as administered by the EPA in regards to this issue. The ballasts shall be packaged/stored in fifty-five gallon steel drums with labels that meet the Department of Transportation Regulations.
  - 3. The Contractor shall identify the costs of the ballast disposal process including, but not limited to, the packaging, storage, transportation, disposal, and any profile fees.
  - 4. Provide at completion of the project documentation (manifests) to verify that the ballasts have properly been disposed of in accordance with all local, state and federal guidelines.

### **3.06 CHASES AND RECESSES**

- A. Provided by the architectural trades, but the Contractor shall be responsible for their accurate location and size.

**3.07 CUTTING, PATCHING AND DAMAGE TO OTHER WORK**

- A. Refer to General Conditions for requirements.
- B. All cutting, patching and repair work shall be performed by the Contractor through approved, qualified subcontractors. Contractor shall include full cost of same in bid.

**3.08 EQUIPMENT CONNECTIONS**

- A. Make connections to equipment and other items included in the work in accordance with the approved shop Drawings and rough-in measurements furnished by the manufacturers of the particular equipment furnished. All additional connections not shown on the Drawings, but called out by the equipment manufacturer's shop Drawings shall be provided.

**3.09 CLEANING**

- A. All debris shall be removed daily as required to maintain the work area in a neat, orderly condition.
- B. Final cleanup shall include, but not be limited to, washing of fixture lenses or louvers, switchboards, substations, motor control centers, panels, etc. Fixture reflectors and lenses or louvers shall be left with no water marks or cleaning streaks.

**3.10 PROTECTION AND HANDLING OF EQUIPMENT AND MATERIALS**

- A. Equipment and materials shall be protected from theft, injury or damage.
- B. Protect conduit openings with temporary plugs or caps.
- C. Provide adequate storage for all equipment and materials delivered to the job site. Location of the space will be designated by the Owner's representative or Architect/Engineer. Equipment set in place in unprotected areas must be provided with temporary protection.

**3.11 DRAWINGS AND MEASUREMENTS**

- A. The Drawings are not intended to be scaled for rough-in measurements nor to serve as Shop Drawings. Field measurements necessary for ordering materials and fitting the installation to the building construction and arrangement are the Contractor's responsibility. The Contractor shall check latest Architectural Drawings and locate light switches from same where door swings are different from Electrical Drawings.

**END OF SECTION 26 0010**

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. Section includes:
1. Building wires and cables rated 600V and less.
  2. Connectors, splices, and terminations rated 600 V and less.

#### 1.03 SUBMITTALS

- A. Field Quality-Control Test Reports
- B. Submit letter of compliance (intent) for general building wire and cable. Provide product data for the following:
1. Power Cable for Variable Frequency Controlled Motors

#### 1.04 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

### PART 2 - PRODUCTS

#### 2.01 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Standards:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

- C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- D. Conductor Insulation:
  - 1. Type THHN/THWN-2: Comply with UL 83.
  - 2. Type THW/THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
  - 3. Type XHHW-2: Comply with UL 44.
- E. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- F. Manufacturers:
  - 1. AFC Cable Systems.
  - 2. Alpha Wire Company.
  - 3. American Bare Conductor.
  - 4. Belden.
  - 5. Encore.
  - 6. General Cable.
  - 7. Okonite.
  - 8. Service Wire Co.
  - 9. Southwire Company.
- G. Standards:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. Comply with UL 1569.
  - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- H. Circuits:
  - 1. Single circuit and multi-circuit with color-coded conductors for branch circuit distribution.
  - 2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.
- I. Conductors:
  - 1. Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- J. Ground Conductor: Insulated. Ground conductor sized as indicated on drawings (reduced ground conductor is not acceptable).
- K. Conductor Insulation:
  - 1. Type TFN/THHN/THWN-2: Comply with UL 83.
  - 2. Type XHHW-2: Comply with UL 44.

## **2.02 POWER CABLE FOR VARIABLE FREQUENCY CONTROLLED MOTORS**

- A. Description: A factory assembly of three conductor cable with three symmetrical ground conductors, a continuous shield and overall PVC jacket.
- B. Manufacturers:
  - 1. Southwire Armor-x
  - 2. Belden
  - 3. Draka
- C. Standards:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. Comply with UL 1277
  - 3. Comply with ICEA S-95-658/NEMA WC 70 for Type TC-ER Power Cable (for VFD application)
  - 4. Comply with NEMA WC 61
  - 5. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Circuits:
  - 1. Single circuit feeder.



- E. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- F. Ground Conductor: Bare copper.
- G. Conductor Insulation: Type XLPE. Comply with UL 83. 600V and 2000V as required by the application.
- H. Shield: Dual spiral copper tape shields for 100% coverage.
  - 1. Shield transfer impedance shall be less than 10 ohms per meter up to 30 MHZ when tested in accordance with NEMA WC 61
- I. Armor: Steel OR Aluminum, interlocked.
- J. Jacket: Oil resistant PVC

### **2.03 CONNECTORS AND SPLICES**

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

## **PART 3 - EXECUTION**

### **3.01 CONDUCTOR MATERIAL APPLICATIONS**

- A. Refer to application schedule on the drawings
- B. If providing aluminum feeders, contractor is responsible to provide calculations for engineer to review prior to installation. Calculations to include voltage drop, equipment ground size, conduit size and any de-rating required.
- C. Feeders and Branch Circuits: Solid or stranded for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
- D. Each feeder shall be of the same conductor and insulation material (phase, neutral, and parallel).
- E. Use conductor not smaller than 14 AWG for control circuits,
- F. Where equipment is listed for use with copper conductors only, use copper conductors for the entire length of feeder.

### **3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS**

- A. Refer to application schedule on the drawings
- B. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel wire-mesh strain relief device at terminations to suit application.
- C. Fire Alarm Circuits: Type THHN/THWN-2, in raceway.
- D. Class 1 Control Circuits: Type THHN/THWN-2, in raceway.
- E. Class 2 Control Circuits: Type THHN/THWN-2, in raceway.
- F. Connection between Variable Frequency Controllers and Motors: Use 2000V rated VFC power cable. Support 5' on center, minimum. Terminate according to cable manufacturer's recommendations.

### **3.03 INSTALLATION OF CONDUCTORS AND CABLES**

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 26 0533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

- F. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
- G. Support communication cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure. Do not rest cable on ceiling panels.
- H. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- I. Provide a separate neutral conductor for each circuit unless multi-wire branch circuits are specifically indicated on the drawings.
- J. Electrical Contractor shall be responsible for de-rating of conductors as required by N.E.C. when more than three current carrying conductors are installed in a single raceway or cable. Neutral conductors shall be considered current carrying conductors.
- K. Between support, hangers and termination no more than 3" deflection from the bottom of the cable to a horizontal line between the support/hanger or termination.

### **3.04 CONNECTIONS**

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.
- D. Clean conductor surfaces before installing lugs and connectors.
- E. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- F. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and larger.
- G. Use piercing connector with insulating covers for conductor splices and taps, 8 AWG and larger only for taps to existing feeders. Do not use piercing connectors in new construction.
- H. Use Sta-Kon connectors to terminate stranded conductors #10 AWG and smaller to screw terminals.
- I. Use insulated spring wire connectors with plastic caps (wire nuts) for copper conductor splices and taps, 10 AWG and smaller. Push-in style connectors are not permitted.
- J. Provide lugs suitable for bussing and conductor material used.

### **3.05 IDENTIFICATION**

- A. Identify and color-code conductors and cables according to Section 26 0553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

### **3.06 FIRESTOPPING**

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping".

### **3.07 FIELD QUALITY CONTROL**

- A. Perform the following field quality control tests in accordance with Division 26 section "Electrical Testing"
  - 1. Description: Test all feeders rated 100 A and above.
  - 2. Visual and Mechanical Inspection.
    - a. Inspect cables for physical damage and proper connection in accordance with the one line diagram.
    - b. Test cable mechanical connections with an infrared survey.
    - c. Check cable color-coding against project Specifications and N.E.C. requirements.

3. Electrical Tests.
  - a. Perform insulation resistance test on each conductor with respect to ground and adjacent conductors. Applied potential to be 1000 volts dc for 1 minute.
  - b. Perform continuity test to insure proper cable connection.
4. Test Values
  - a. Minimum insulation resistance values shall be not less than fifty mega-ohms.
- B. Test Reports: Prepare a written report to record the following:
  1. Test procedures used.
  2. Test results that comply with requirements.
  3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

**END OF SECTION 26 0519**

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## **SECTION 26 0526 - GROUNDING AND BONDING**

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### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### **1.02 SUMMARY**

- A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.
- B. Related Sections include the following:
  - 1. Division 26 Section "Electrical General Requirements".
  - 2. Division 26 Section "Conductors and Cables".

#### **1.03 REFERENCES**

- A. ASTM B 3: Specification for Soft or Annealed Copper Wire.
- B. ASTM B 8: Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard or Soft.
- C. ASTM B 33: Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes.
- D. ASTM B 187: Specification for Copper, Bus Bar, Rod, and Shapes and General Purpose Rod, Bar, and Shapes.
- E. IEEE 81: Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.
- F. IEEE 142: Grounding of Industrial and Commercial Power Systems.
- G. IEEE C2: National Electrical Safety Code.
- H. NETA MTS – 2001: Maintenance Testing Specifications.
- I. NFPA 70: National Electrical Code.
- J. NFPA 70B: Recommended Practice for Electrical Equipment Maintenance.
- K. TIA/EIA 607: Commercial Building Grounding and Bonding Requirements Standard.
- L. UL 467: Grounding and Bonding Equipment.
- M. UL 486 A: Wire Connectors and Soldering Lugs for Use with Copper Conductors.

#### **1.04 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

- C. Field Test Reports: Submit written test reports to include the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
  - 4. Indicate overall system resistance to ground.

#### **1.05 PROJECT RECORD DOCUMENTS**

- A. Submit under provisions of Division 26 "Electrical General Requirements".

#### **1.06 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Refer to specification section "Electrical Testing."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
  - 1. Comply with UL 467.
- C. Comply with ANSI/TIA/EIA-607 "Standard for Commercial Building Grounding and Bonding Requirements for Telecommunications".

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Grounding Conductors and Cables:
    - a. Refer to Division 26 Section "Conductors and Cables".
  - 2. Mechanical Connectors:
    - a. American Electric-Blackburn.
    - b. Burndy.
    - c. Chance/Hubbell.
  - 3. Exothermic Connections:
    - a. Cadweld.
  - 4. Compression-type Connectors:
    - a. Burndy HyGround
    - b. Blackburn EZ Ground.
    - c. Panduit.

#### **2.02 GROUNDING CONDUCTORS**

- A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."
- B. Material: copper.
- C. Equipment Grounding Conductors: Insulated with green-colored insulation.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Bare Copper Conductors: Comply with the following:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Assembly of Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.
- F. Copper Bonding Conductors: As follows:
  - 1. Bonding Conductor: Stranded copper conductor; size per the NEC.
  - 2. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; size per the NEC.
  - 3. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; size per the NEC.
- G. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

## **2.03 CONNECTOR PRODUCTS**

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected for the specific application per manufacturer's written instructions.
- D. Compression-Type Connectors: Pure, wrought copper, per ASTM B187.

## **PART 3 - EXECUTION**

### **3.01 EQUIPMENT GROUNDING**

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- C. In raceways, use insulated equipment grounding conductors.
- D. Install equipment grounding conductors in all feeders and circuits. Terminate each end on suitable lugs, bus or bushing.
- E. Verify specific equipment grounding requirements with the manufacturer's recommendations.

### **3.02 CONNECTIONS**

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
  - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
  - 2. Make connections with clean, bare metal at points of contact.
  - 3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells. Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations
  - 1. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and larger.
  - 2. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
- D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A as applicable.
- F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Connections shall be non-reversible. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

**3.03 INSTALLATION**

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage. Install in conduit where routed above grade.
- B. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors or non-reversing compression-type connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- C. Bond interior metal piping systems, including any portions of metal piping systems separated by non-metal piping, and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.
- D. Equipment Grounding: Provide a permanent and continuous bonding of conductor enclosures, equipment frames, power distribution equipment ground busses, cable trays, metallic raceways, and other non-current carrying metallic parts of the electrical system.
- E. Bond together metal building elements not attached to grounded structure; bond to ground.

**3.04 FIELD QUALITY CONTROL**

- A. Testing: Perform the following field quality control tests in accordance with Division 26 section "Electrical Testing"
  - 1. Inspect grounding and bonding system conductors and connections for tightness and proper installation and for compliance with the Drawings and Specifications.
    - a. Equipment Grounds: Utilize two-point method of IEEE 81. Measure between equipment ground being testing and known low-impedance grounding electrode or system.

**END OF SECTION 26 0526**



## SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

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### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Hangers and supports for electrical equipment and systems.

#### 1.03 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. RMC: Rigid metal conduit.

#### 1.04 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

#### 1.05 SUBMITTALS

- A. Product Data: For the following:
  - 1. Steel slotted support systems.

#### 1.06 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

### **1.07 COORDINATION**

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

## **PART 2 PRODUCTS**

### **2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allied Tube & Conduit; a part of Atkore International.
    - b. B-Line, by Eaton.
    - c. GS Metals Corp.
    - d. Pentair Electrical & Fastening Solutions.
    - e. Thomas & Betts Corporation.
    - f. Unistrut; a part of Atkore International.
    - g. Wesanco, Inc.
  - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  - 3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
  - 4. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
  - 1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) B-Line by Eaton.
      - 2) Empire Tool and Manufacturing Co., Inc.
      - 3) Hilti Inc.
      - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      - 5) MKT Fastening, LLC.
  - 2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
  - 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
  - 4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
  - 5. Toggle Bolts: All-steel springhead type.
  - 6. Hanger Rods: Threaded steel.

## **PART 3 EXECUTION**

### **3.01 APPLICATION**

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, and RMC as required by NFPA 70 or as scheduled in NECA 1. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with:
    - a. Two-bolt conduit clamps
    - b. Single-bolt conduit clamps
    - c. Single-bolt conduit clamps using spring friction action for retention in support channel.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

### **3.02 SUPPORT INSTALLATION**

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. To Existing Concrete: Expansion anchor fasteners.
  - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
  - 6. To Steel:
    - a. Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
    - b. Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69
    - c. Spring-tension clamps.
  - 7. To Light Steel: Sheet metal screws.
  - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel support systems attached to substrate.
- E. Slotted support systems applications:
  - 1. Indoor dry and damp Locations: Painted Steel
  - 2. Outdoors and interior wet locations: Galvanized Steel

- F. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.
- G. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- H. Obtain permission from Architect/Engineer before using powder-actuated anchors.
- I. Obtain permission from Architect/Engineer before drilling or cutting structural members.
- J. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- K. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- L. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.
- M. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
- N. The Contractor shall replace all supports and channels that sag, twist, and/or show signs of not providing proper structural support, to the equipment, it is intended for, as determined by the Owner and Architect/Engineer. All costs associated with replacing supports and steel channels shall be incurred by the Contractor.

### **3.03 PAINTING**

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

### **END OF SECTION 26 0529**

## SECTION 26 0533 - RACEWAYS AND BOXES

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### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
  - 1. Division 07 Section, "Penetration Firestopping" for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
  - 2. Division 26 "Hangers and Supports for Electrical Systems" for concrete bases.

#### 1.03 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. LFMC: Liquidtight flexible metal conduit.

#### 1.04 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

#### 1.05 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

## **1.06 COORDINATION**

- A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

## **PART 2 PRODUCTS**

### **2.01 METAL CONDUIT AND TUBING**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AFC Cable Systems, Inc.
  - 2. Alflex Inc.
  - 3. Allied Tube Triangle Century.
  - 4. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 5. International Metal Hose.
  - 6. Electri-Flex Co
  - 7. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
  - 8. LTV Steel Tubular Products Company – Manhattan/CDT/Cole-Flex.
  - 9. Maverick.
  - 10. O-Z Gedney; unit of General Signal.
  - 11. Wheatland.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. EMT: ANSI C80.3.
- D. LFMC: Flexible steel conduit with PVC jacket.
- E. Fittings for Conduit (Including all Types and Liquidtight flexible metal conduit), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
  - 1. Fittings for EMT: Steel, compression type.

### **2.02 BOXES, ENCLOSURES, AND CABINETS**

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1. Shall be used within walls or ceiling.
- B. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

### **2.03 SLEEVES FOR RACEWAYS**

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

### **2.04 SLEEVE SEALS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Advance Products & Systems, Inc.
  - 2. Calpico, Inc.
  - 3. Metraflex Co.
  - 4. Pipeline Seal and Insulator, Inc.
- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
  - 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
  - 2. Pressure Plates: Carbon steel. Include two for each sealing element.

3. 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.

## **2.05 GROUT**

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

## **2.06 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES**

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
  1. Tests of materials shall be performed by a independent testing agency.
  2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
  3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

# **PART 3 EXECUTION**

## **3.01 RACEWAY APPLICATION**

- A. Provide raceways in interior and exterior locations in accordance with the "Raceway Application Matrix" included on the drawings.
- B. Boxes and Enclosures, Exterior Aboveground: NEMA 250, Type 4X.
- C. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.
- D. Boxes installed in rated walls shall be fireproofed to maintain the rating of the wall.
- E. Minimum Raceway Size: 3/4-inch trade size.
- F. Raceway Fittings: Compatible with raceways and suitable for use and location.
  1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
  2. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
  3. Liquidtight metal Flexible Conduit: Use only fittings listed for use with liquidtight metal flexible conduit. Comply with NEMA FB 2.20.
- G. Install surface raceways only where indicated on Drawings.

## **3.02 INSTALLATION**

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Install temporary closures to prevent foreign matter from entering raceways.
- F. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
- G. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- H. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- I. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- J. Support conduit within 12 inches of enclosures to which attached.
- K. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
  1. Run parallel or banked raceways together on common supports.
  2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- P. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- Q. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- R. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- S. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- T. Provide pull string and 25% spare capacity in every branch circuit conduit.
- U. Communications and Signal Cabling Systems Raceways: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
  1. Electrical conduit (LB's) are not permitted.
  2. Conduits shall have no more than two 90 degree bends between pull points or pull boxes.
  3. Conduits shall contain no continuous sections longer than 150 ft. without a pull point/box.
  4. Conduit for fiber cabling shall have a bend radius of at least 10 times the internal diameter.
  5. Conduit for copper cabling less than 2" shall have a bend radius of at least 6 times the internal diameter. Conduit for copper cabling 2" and larger shall have a bend radius of at least 10 times the internal diameter.
  6. All conduit ends shall have an insulated bushing.
- V. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
  1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  2. Where conduits route through, to, or from a hazardous classified space (Class I or II), provide proper seal offs when exiting or entering the hazardous classified space.
  3. Where conduits pass between spaces that are maintained at two different vapor pressures.
  4. Where otherwise required by NFPA 70.



- W. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- X. Expansion-Joint Fittings:
  - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
  - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    - d. Attics: 135 deg F temperature change.
  - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
  - 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
  - 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- Y. Flexible Conduit Connections: Comply with NEMA RV3. Use maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- Z. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals. Provide cover clips to cover space between connecting pieces.
- AA. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- BB. Locate boxes so that cover or plate will not span different building finishes.
- CC. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- EE. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
- FF. Do not route feeders across roof.
- GG. Provide a pull box (a handhole for outdoor applications) for each conduit run that exceeds 250 feet. Provide two pull boxes (handholes for outdoor applications) for runs that exceed 500 feet.
- HH. Route conduits in finished areas with exposed ceilings at underside of structural deck or as high as possible.

### **3.03 SLEEVE INSTALLATION FOR ELECTRICAL AND COMMUNICATIONS PENETRATIONS**

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Through-Penetration Firestop Systems."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

- D. Rectangular Sleeve Minimum Metal Thickness:
  - 1. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
  - 2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.
- E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- F. Cut sleeves to length for mounting flush with both surfaces of walls.
- G. Extend sleeves installed in floors 2 inches above finished floor level.
- H. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed.
- I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 7 Section "Through-Penetration Firestop Systems."
- L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.
- M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway and sleeve for installing mechanical sleeve seals.

### **3.04 SLEEVE-SEAL INSTALLATION**

- A. Install to seal underground, exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

### **3.05 FIRESTOPPING**

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Through-Penetration Firestop Systems."

### **3.06 PROTECTION**

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

### **3.07 CLEANING**

- A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

### **END OF SECTION 26 0533**

## SECTION 26 0553 - ELECTRICAL IDENTIFICATION

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### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes the following:
1. Identification for raceway.
  2. Identification for conductors and communication and control cable.
  3. Warning labels and signs.
  4. Instruction signs.
  5. Equipment identification labels.
  6. Miscellaneous identification products.

#### 1.03 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and ANSI C2.  
B. Comply with NFPA 70.  
C. Comply with 29 CFR 1910.145.

#### 1.04 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

### PART 2 PRODUCTS

**2.01 RACEWAY IDENTIFICATION MATERIALS**

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Color for Printed Legend:
  - 1. Power Circuits: Black letters on an orange field.
  - 2. Legend: Indicate system or service and voltage, if applicable.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

**2.02 CONDUCTOR, COMMUNICATION AND CONTROL CABLE IDENTIFICATION MATERIALS**

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

**2.03 WARNING LABELS AND SIGNS**

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Warning label and sign shall include, but are not limited to, the following legends:
  - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
  - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

**2.04 INSTRUCTION SIGNS**

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
  - 1. Engraved legend with black letters on white face.
  - 2. Punched or drilled for mechanical fasteners.
  - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

**2.05 EQUIPMENT IDENTIFICATION LABELS**

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. Black letters on a white background. Minimum letter height shall be 3/8 inch.

**2.06 MISCELLANEOUS IDENTIFICATION PRODUCTS**

- A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
  - 1. Minimum Width: 3/16 inch.
  - 2. Tensile Strength: 50 lb, minimum.
  - 3. Temperature Range: Minus 40 to plus 185 deg F.
  - 4. Color: Black, except where used for color-coding.
- B. Paint: Paint materials and application requirements are specified in Division 9 painting Sections.
- C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

**2.07 WIRING DEVICE IDENTIFICATION**

- A. Description: Self adhesive label with black upper case letters on clear polyester label, font size 7.

## **PART 3 EXECUTION**

### **3.01 APPLICATION**

- A. All switches and receptacles shall have their circuit numbers identified on the cover plate surface. Use a label maker for this purpose.
- B. Electrical equipment and conduits shall be labeled, tagged and stenciled as described herein.
  - 1. Labels shall be adhesive tape. Similar to brother P touch or DYMO.
  - 2. Nameplates shall be plastic laminate similar to GravoPLY and engraved with information.
  - 3. All electrical equipment shall be labeled per this standard.
  - 4. Wire markers shall be labeled per the N.E.C.
  - 5. Conduit markers shall be labeled per the N.E.C.
  - 6. Wire color code shall comply with N.E.C.
  - 7. Install nameplates for the following:
    - a. Mechanical Equipment Disconnects
    - b. Motor Control Centers & Motor Starters
    - c. Control Circuits
    - d. Circuit Breakers
    - e. Switches
- C. Nameplates shall be located at the source and at the load for each circuit.
- D. Accessible Raceways, 600 V or Less, for Service and Feeders More Than 400 A: Identify with orange self-adhesive vinyl label.
- E. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands:
  - 1. Fire Alarm System: Red.
  - 2. Security System: Blue and yellow.
  - 3. Telecommunication System: Green and yellow.
  - 4. Control Wiring: Green and red.
- F. Power-Circuit Conductor Identification: For conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape and marker tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.
- G. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use marker tape. Identify each ungrounded conductor according to source and circuit number as indicated on Drawings. Identify control circuits by control wire number as indicated on shop drawings.
- H. Branch-Circuit Conductor Identification: Mark junction box covers in indelible ink with the panel and breaker numbers of other circuits contained within.
- I. Conductor Identification: Locate at each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection or termination point.
- J. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.
  - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
  - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
  - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.
- K. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
  - 1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
    - a. Power transfer switches.
    - b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
- L. Instruction Signs:
  1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
  2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.
- M. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
  1. Labeling Instructions:
    - a. Indoor Equipment: Engraved, laminated acrylic or melamine label mechanically secured.
    - b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
  2. Equipment to Be Labeled: If included on project. All items may not be on project.
    - a. Panelboards, electrical cabinets, and enclosures.
    - b. Access doors and panels for concealed electrical items.
    - c. Electrical switchgear and switchboards.
    - d. Emergency system boxes and enclosures.
    - e. Motor-control centers.
    - f. Disconnect switches.
    - g. Enclosed circuit breakers.
    - h. Motor starters.
    - i. Push-button stations.
    - j. Power transfer equipment.
    - k. Contactors.
    - l. Remote-controlled switches, dimmer modules, and control devices.
    - m. Monitoring and control equipment.
    - n. Breakers or switches at distribution panels.
- N. Wiring Device Identification Labels: On each faceplate install circuit designation label that is consistent with panelboard directories, and as-built plan drawings. Apply labels to receptacle faceplates centered below bottom outlet. Apply labels to toggle switch faceplates on backside.

### **3.02 INSTALLATION**

- A. Verify identity of each item before installing identification products.
- B. Location:
  1. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
  2. Conduit Markers: Provide identification for each power conduit containing conductors rated 400A or greater.
- C. Apply identification devices to surfaces after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

- F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.
1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
  2. Colors for 208/120-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
    - c. Phase C: Blue.
    - d. Grounded Conductor (Neutral): White.
  3. Colors for 480/277-V Circuits:
    - a. Phase A: Brown.
    - b. Phase B: Orange.
    - c. Phase C: Yellow.
    - d. Ground Conductor (Neutral): Grey.
  4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- H. Label information arrangement for 3 lines of text.

1. Nameplate Tags:

- a. There are various voltages configurations on CMU's campus. The following label series shall be used as a part of main distribution label to identify voltage configuration of specific equipment.

Campus Voltage Configurations	Label Series
12,470 Volt, 3 phase, 3 wire 12.47	12.47
7,200 Volt, 1 phase, 3 wire 7.2	7.2
480 Volt, 3 phase, 3 wire 400	400
480 Volt, 3 phase, 3 wire 400	400
120/280 Volt, 3 phase, 4 wire 200	200
120/240 Volt, 1 phase, 3 wire 100	100
Emergency 300	300

- 1) Each nameplate shall be attached using corrosive-resistant mechanical fasteners.
    - 2) Tag Size: 1 1/2" x 4"x 1/8" Plastic laminate.
    - 3) Tag Color:
      - a) Normal Power – White letters on Black background.
      - b) Emergency Power – White letters on Red background.
  2. Tag Information shall be engraved as follows:
    - a. Line #1 Building Code-Source panel-overcurrent device number
    - b. Line #2 Load being serviced
    - c. Line #3 Location
    - d. For example: Over Current Device (OCD) 401 in Switchboard 'A' in Brooks Hall serving the basement motor control center would have the following label:

<p><b>BR-SWBD A-401</b></p> <p><b>MCC</b></p> <p><b>BASEMENT</b></p>
--

- e. At the Motor Control Center the label shall read:

**MCC  
Fed from  
BR-SWBD A-401**

- f. At the Switchboard, the numbering of the OCD's shall be sequential (Example: 401, 402, 403, etc.) after main switch.  
g. The 100, 200, 300, 400 numbers (see voltage configuration in paragraph D) are reserved for main switches. Main O.C.D. shall be labeled:

**BR-SWBD A-400  
Main  
Disconnect**

3. Provide 1/8" border on top and bottom of nameplate and 1/8" spacing between lines. Center text in the nameplate so as to provide room for the mechanical fasteners.
- a. Line 1: letter height 3/8"
  - b. Line 2: letter height 5/16"
  - c. Line 3: letter height 5/16"
- I. Match University Standards.
  - J. Fusible Enclosed Switches and Distribution Equipment: Install self-adhesive vinyl label indicating fuse rating and type on the outside of door on each fused switch.
  - K. Painted Identification: Prepare surface and apply paint according to Division 9 painting Sections.
  - L. Degrease and clean surface to receive nameplates.
  - M. Install nameplate and labels parallel to equipment lines.
  - N. Secure nameplate to equipment front using screws.
  - O. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.
  - P. Identify conduit using field painting where required.
  - Q. Paint red colored band on each fire alarm conduit and junction box.
  - R. Paint bands 10 feet on center, and 4 inches minimum in width.

**END OF SECTION 26 0553**



## SECTION 26 0923 - LIGHTING CONTROL DEVICES

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### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes the following lighting control devices:
  - 1. indoor photoelectric control.
  - 2. Occupancy sensors.
- B. Related Sections include the following:
  - 1. Division 26 Section "Electrical General Requirements".
  - 2. Division 26 Section "Wiring Devices" for wall-box dimmers and manual light switches.

#### 1.03 REFERENCES

- A. IEEE C62.41: Guide for Surge Voltages in Low-Voltage AC Power Circuits.
- B. IEEE C136.10: Standard for Roadway Lighting Equipment Locking-Type Photocontrol Devices and Mating Receptacle Physical and Electrical Interchangeability and Testing.
- C. NEMA ICS 2: Industrial Control and Systems Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC Part 8: Disconnect Devices for Use in Industrial Control Equipment.
- D. NFPA 70: National Electrical Code.
- E. UL 486A: Wire Connectors and Soldering Lugs for Use with Copper Conductors.
- F. UL 773: Plug-in, Locking Photocontrols for Use with Area Lighting.
- G. UL 773A: Nonindustrial Photoelectric Switches for Lighting Control.
- H. UL 917: Clock Operated Switches.
- I. UL 1449: Surge Protective Devices.
- J. UL 1598: Luminaires.
- K. NECA 130-2010: Installing and Maintaining Wiring Devices.

#### 1.04 DEFINITIONS

- A. LED: Light-emitting diode.

- B. PIR: Passive infrared.
- C. ULTRASONIC: Active emission of at least 35 kHz sound waves, using Doppler reflectance to detect motion.
- D. MICROPHONIC: Passive reception to listen for continued occupancy, with circuitry to filter out white noise.
- E. MULTI-Tech: Using PIR and ultrasonic or microphonic technologies in one sensor.

#### **1.05 SUBMITTALS**

- A. Product Data: For each type of product indicated including physical data and electrical performance.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
  - 1. Lighting plan showing location, orientation, and coverage area of each sensor.
  - 2. Interconnection diagrams showing field-installed wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. Include the following:
  - 1. Description of operation and servicing procedures.
  - 2. List of major components.
  - 3. Recommended spare parts.
  - 4. Programming instructions and system operation procedures.

#### **1.06 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

#### **1.07 COORDINATION**

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
- B. Coordinate interface of lighting control devices with temperature controls specified in Division 23.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to the site under provisions of Division 26 Section "Electrical General Requirements".
- B. Store and protect products under provisions of Division 26 Section "Electrical General Requirements".

### **PART 2 PRODUCTS**

#### **2.01 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS**

- A. Line-Voltage Surge Protection: An integral part of the devices for 120- and 277-V solid-state equipment. For devices without integral line-voltage surge protection, field-mounting surge protection shall comply with IEEE C62.41 and with UL 1449.

#### **2.02 INDOOR PHOTOELECTRIC CONTROL**

- A. Manufacturers:
  - 1. Wattstopper LS-101.
  - 2. Sensorswitch CM-PC.
- B. Photoelectric Sensor: Solid-state, light-level sensor unit utilizing an internal photoconductive cell to detect changes in lighting levels and capable of controlling any lighting source.
  - 1. Housing: White, thermoplastic, tamper resistant, ceiling mount.

2. Sensor shall operate on 24V DC power through a control unit which supplies DC power to the sensor and provides relay contacts to control the lighting load and auxiliary contacts.
  3. Light-Level Monitoring Range: 10 to 200 footcandle, with an adjustment for turn-on and turn-off levels within that range.
  4. Deadband: Adjustable range of 10 to 300%.
  5. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with deadband adjustment.
  6. Indicator: Two LEDs to indicate the beginning of on and off cycles.
  7. Manual override function.
  8. Provide indoor photoelectric switches and control units from single manufacturer.
  9. Provide indoor photoelectric switches from same manufacturer as occupancy sensors.
  10. Provide all control units and relays required to interface with occupancy sensors as required.
- C. Indoor Photoelectric Sensor Control Units:
1. Description: Transformer and relay combined in single unit to provide 24DC power to sensors and provide 20A contact(s) for control of lighting loads at 120 or 277V. Control unit input power shall be from unswitched leg of lighting circuit it is controlling.
    - a. Control units shall be provided as required to power indoor photoelectric sensor, control lighting loads and provide a minimum of one auxiliary contact.
    - b. Sensor control units shall mount external to 4" sq junction box in the ceiling space. Wiring between control unit and photoelectric switch shall be plenum rated.
    - c. Locate control unit in accessible location in gyp-board ceilings, adjacent to return air grilles, or provide access panel.
    - d. Additional auxiliary relay modules shall be provided as required to provide control of all lighting circuits and additional auxiliary contacts as required.
    - e. It is acceptable to provide controls and auxiliary contacts as required integral to the sensor, provided all required contacts are provided.
    - f. Maximum of 3 sensors per power pack. Verify exact quantities required with manufacturer.

## **2.03 OCCUPANCY SENSORS**

- A. General
1. Coordinate occupancy sensor locations, coverages and required quantities with manufacturer's recommendations. Coverage areas indicated on the Drawings are for minor motion (6 to 8 inches of hand movement). Provide additional occupancy sensors and control units as required to achieve complete minor motion coverage of the space indicated.
  2. Adjust occupancy sensors and test that complete minor motion coverage is obtained in accordance with Part 3. Provide written confirmation of testing to owner, architect and engineer.
  3. Provide occupancy sensors with a bypass switch to override the "ON" function in the event of sensor failure.
  4. Provide occupancy sensors with an LED indicator indicating when motion is being detected during testing and normal operation of the sensor.
  5. Provide occupancy sensors and occupancy sensor control units from single manufacturer.
- B. Wall Switch Passive Infrared Occupancy Sensor
1. Manufacturers:
    - a. Wattstopper (Basis of Design).
    - b. Lutron.
  2. Description: Wall mounted, 180° coverage, passive infrared sensing occupancy sensor.
    - a. Electrical Characteristics: Capable of switching up to 800W fluorescent or incandescent lighting loads at 120V and 1200 watts fluorescent loads at 277V.
    - b. Functions: Automatic ON/Automatic OFF, or Manual ON/Automatic OFF operation, field selectable. Integral manual override pushbutton switch.

- c. Adjustments: User adjustable sensitivity and time delay. Time delay shall be adjustable from 30 seconds to 30 minutes. Ambient light sensing shall be adjustable from 20 footcandle to 300 footcandle, with override.
    - d. Ambient Light Sensor: Integral ambient light sensor to switch off lights when sufficient daylight is present.
    - e. Device Body: White, plastic with momentary on/off override pushbutton designed to mount in a standard switch box with "decora" style switch plate.
  - 3. Dual Level Switching: Provide occupancy sensor capable of controlling two switch legs independently where dual level switching is indicated.
    - a. Manufacturers:
      - 1) Wattstopper (Basis of Design).
      - 2) Lutron.
- C. 360° Ceiling Mounted Dual Technology Occupancy Sensor
  - 1. Manufacturers:
    - a. Wattstopper (Basis of Design).
    - b. Lutron.
  - 2. Description: Ceiling mounted, 360° coverage, multi-tech sensing occupancy sensor.
    - a. Housing: White, thermoplastic, tamper resistant ceiling mount.
    - b. Functions: Automatic ON must sense motion from both ultrasonic and infrared sensing elements. Either technology shall maintain ON, with adjustable time delays.
    - c. Adjustments: User adjustable sensitivity adjustment shall be provided for each sensing technology. Time delay shall be adjustable from 30 seconds to 30 minutes.
    - d. Sensor shall operate on 24V DC power through control unit which supplies DC power to the sensor and provides relay contacts to control the lighting load and auxiliary contacts.
    - e. Manual override function.
- D. 110° Wall Mounted Dual Technology Occupancy Sensor
  - 1. Manufacturers:
    - a. Wattstopper (Basis of Design).
    - b. Lutron.
  - 2. Description: Wall mounted, 110° coverage, multi-tech occupancy sensor.
    - a. Housing: White, thermoplastic, tamper resistant with swivel bracket for wall or ceiling mounting.
    - b. Functions: Automatic ON must sense motion from both sensing elements. Either technology shall maintain ON, with adjustable time delays.
    - c. Adjustments: User adjustable sensitivity adjustment shall be provided for each sensing technology. Time delay shall be adjustable from 30 seconds to 15 minutes.
    - d. Sensor Orientation: Orient sensor in room such that sensor will not detect motion through open door which could cause false activation.
    - e. Sensor shall operate on 24V DC power through control unit which supplies DC power to the sensor and provides relay contacts to control the lighting load and auxiliary contacts.
    - f. Manual override function.
- E. 360° Ceiling Mounted Ultrasonic Occupancy Sensors
  - 1. Manufacturers:
    - a. Wattstopper (Basis of Design).
    - b. Lutron.
  - 2. Description: Ceiling mounted, 360° coverage, ultrasonic or microphonics sensing occupancy sensor.
    - a. Housing: White, thermoplastic, tamper resistant.
    - b. Adjustments: Adjustments: User adjustable sensitivity and time delay. Time delay shall be adjustable from 30 seconds to 15 minutes.

- c. Sensor shall operate on 24V DC power through control unit which supplies DC power to the sensor and provides relay contacts to control the lighting load and auxiliary contacts.
    - d. Manual override function.
  - F. 360° Ceiling Mounted Passive Infrared Occupancy Sensor.
    - 1. Manufacturers:
      - a. Wattstopper (Basis of Design).
      - b. Lutron.
    - 2. Description: Ceiling mounted, 360° coverage, infrared sensing occupancy sensor.
      - a. Housing: White, thermoplastic, tamper resistant ceiling mount.
      - b. Adjustments: User adjustable sensitivity adjustment shall be provided for each sensing technology. Time delay shall be adjustable from 30 seconds to 30 minutes.
      - c. Sensor shall operate on 24V DC power through control unit which supplies DC power to the sensor and provides relay contacts to control the lighting load and auxiliary contacts.
      - d. Manual override function.
- G. Occupancy Sensor Control Units:
  - 1. Description: Transformer and relay combined in single unit to provide 24DC power to sensors and provide 20A contact(s) for control of lighting loads at 120 or 277V. Control unit input power shall be from unswitched leg of lighting circuit it is controlling.
    - a. Control units shall be provided as required to power ceiling mounted occupancy sensors, control lighting loads and provide a minimum of one auxiliary contact.
    - b. Occupancy sensor control units shall mount external to 4" sq junction box in the ceiling space. Wiring between control unit and occupancy sensor shall be plenum rated.
    - c. Locate control unit in accessible location in gyp-board ceilings, adjacent to return air grilles, or provide access panel.
    - d. Additional auxiliary relay modules shall be provided as required to provide control of all lighting circuits and additional auxiliary contacts as required.
    - e. It is acceptable to provide controls and auxiliary contacts as required integral to the ceiling sensor, provided all required contacts are provided.
    - f. Maximum of 3 sensors per power pack. Verify exact quantities required with manufacturer.

## **PART 3 EXECUTION**

### **3.01 OCCUPANCY SENSOR INSTALLATION**

- A. Install wall mounted occupancy sensors as noted on plan. Arrange occupancy sensors with adjacent switch devices so that device plates line-up and are equally spaced.
- B. Install ceiling mounted sensors at approximate locations as indicated on plan. Sensor manufacturer shall provide quantity of sensors as required to provide complete coverage for rooms.
- C. Locate sensors such that motion through open doors will not falsely activate sensors.
- D. Do not locate ultrasonic sensors within six feet of supply air diffusers.
- E. Locate infrared sensors to avoid obstructions.
- F. Provide the services of a manufacturer's representative for commissioning of occupancy sensor installation. This shall include consultation on layout and location prior to installing sensors, testing of each sensor for compliance with Contract Documents and field adjustment and fine tuning after installation is complete. Provide written confirmation of testing to the Owner, Architect and Engineer.
- G. Field adjustments shall take place in the presence of the owner and the engineer. This shall include owner training on adjustment techniques for the occupancy sensors.

**3.02 WIRING INSTALLATION**

- A. Wiring Method: Comply with Division 26 Section "Conductors and Cables".
- B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
- E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

**3.03 IDENTIFICATION**

- A. Identify components and power and control wiring according to Division 26 Section "Electrical Identification."
- B. Label time switches and contactors with a unique designation.

**3.04 FIELD QUALITY CONTROL**

- A. Perform the following field tests and inspections and prepare test reports:
  - 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
  - 2. Operational Test: Verify actuation of each sensor and adjust time delays.
- B. Remove and replace lighting control devices where test results indicate that they do not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

**3.05 ADJUSTING**

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose.

**END OF SECTION 26 0923**

## SECTION 26 0943 - LIGHTING CONTROL SYSTEMS

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes the design and installation programmable automatic lighting controls with all input and control devices necessary to meet the performance indicated on the contract drawings and this specification
- B. Related Sections include the following:
  - 1. Division 26 Section "Lighting Control Devices" for time switches, photoelectric switches, occupancy sensors, and multi-pole contactors.
  - 2. Division 26 Section "LED Interior Lighting" for luminaire specifications and accessories.

#### 1.03 DEFINITIONS

- A. BACnet: A networking communication protocol that complies with ASHRAE 135.
- B. Lon Works: A control network technology platform for designing and implementing interoperable control devices and networks.
- C. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling and power-limited circuits.
- D. RS-485: A serial network protocol, like RS-232, complying with TIA/EIA-485-A.

#### **1.04 SUBMITTALS**

- A. Product Data: Indicating general device descriptions, dimensions, electrical specifications, wiring details, and nomenclature for all sensors, relays, dimming modules, control stations and other devices necessary for complete operation of the system
- B. Shop Drawings: Detail assemblies of standard components, custom assembled for specific application on this Project.
  - 1. Outline Drawings: Indicate dimensions, weights, arrangement of components, and clearance and access requirements for all system components requiring field installation.
  - 2. Riser Diagram: Show interconnection between all system components.
    - a. Identify complete data communication backbone and interconnection between sensors, relays, dimming modules control stations and other components.
    - b. Identify typical room/area type configurations.
    - c. Indicate interconnections with emergency egress lighting relays and transfer devices required.
  - 3. Information Technology (IT) connection: Provide information pertaining to interconnection with facility IT networking equipment and third-party systems.
  - 4. Other Diagrams and Operational Descriptions – as needed to indicate system operation or interaction with other system(s).
  - 5. Contractor startup and commissioning worksheet.
- C. Software and Firmware Operational Documentation:
  - 1. Software operating and upgrade manuals.
  - 2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
  - 3. Device address list.
  - 4. Printout of software application and graphic screens.
- D. Submit qualifications of commissioning agent and draft functional test plans for review and approval.
- E. Field quality-control test reports and commissioning reports at project closeout.
- F. Software licenses and upgrades required by and installed for operation and programming of digital devices.
- G. Operation and Maintenance Data: For lighting controls to include in emergency, operation, and maintenance manuals. Include the following:
  - 1. Software manuals.
  - 2. Operation of adjustable zone controls.
  - 3. Description of operation and servicing procedures.
  - 4. List of major components and recommended parts.
  - 5. System operation and integration instructions.
- H. Warranty: Special warranty specified in this Section.

#### **1.05 QUALITY ASSURANCE**

- A. Source Limitations: Obtain lighting control module and power distribution components through one source from a single manufacturer with total responsibility for compatibility of lighting control system components specified in this Section.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with 47 CFR, Subparts A and B, for Class A digital devices.
- D. Comply with NFPA 70.
- E. Listed as qualified under Design Lights Consortium (DLC) Networked Lighting Control System Specification V2.0.
- F. System luminaires and controls are certified by manufacturer to have been designed, manufactured and tested for interoperability.
- G. Comply with ASHRAE 90.1 - 2013



**1.06 COORDINATION**

- A. Coordinate lighting control components specified in this Section and with systems and components specified in other Sections to form an integrated interconnection of compatible components.
- B. Match components and interconnections for optimum performance of lighting control functions.
- C. Provide open protocol interface for interoperability with building automation system including status of each occupancy/vacancy sensor, control station, dimming module, relay, time schedule, display graphics and status of lighting controls by zone.
- D. Coordinate lighting controls with devices specified in Division 26 Section "Lighting Control Devices".

**1.07 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of lighting controls that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.

**1.08 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Batteries for all sensors and switches: Quantity equal to 10% percent of each type and size, but no fewer than 3 of each type and size.

**1.09 SOFTWARE SERVICE AGREEMENT**

- A. Technical Support: Beginning with Substantial Completion, provide software support for five years.
- B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revise licenses for use of the software.
  - 1. Provide 30-day notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment, if necessary.

**1.10 SYSTEM COMMISSIONING**

- A. Provide the services of a third party, independent agent to perform functional testing and verification of the lighting control system to comply with the requirements of ASHRAE 90.1 – 2013.
- B. Perform functional testing of all lighting control system operations.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Legrand Digital Lighting Management (DLM)
  - 2. BubblyNet Controls
  - 3. Acuity nLight Air
  - 4. Lutron Vive
  - 5. WaveLinx – Eaton

**2.02 SYSTEM PERFORMANCE REQUIREMENTS**

- A. System Architecture

1. System shall have an architecture that is based upon three main concepts: (a) networkable intelligent lighting control devices, (b) standalone lighting control zones using distributed intelligence.
    - a. Intelligent lighting control devices shall have individually addressable network communication capability and consist of one or more basic lighting control components: occupancy sensor, photocell sensor, relay, dimming output, contact closure input, analog 0-10V input, and manual wall station capable of indicating switching, dimming, and/or scene control. Combining one or more of these components into a single device enclosure shall be permissible to minimize overall device count of system.
    - b. Lighting control zones consisting of one or more networked luminaires and intelligent lighting control devices and shall be capable of providing automatic control from sensors (occupancy and/or photocell) and manual control from local wall stations without requiring connection to a higher-level system backbone; this capability is referred to as "distributed intelligence."
    - c. System must be capable of interfacing directly with networked luminaires such that either low voltage network cabling or wireless RF communication is used to interconnect networked luminaires with control components such as sensors, switches.
  2. The system shall provide individually addressable switching and dimming control of the following: networked luminaires, control zones to include multiple switch legs or circuits, and relay and dimming outputs from centralized panels to provide design flexibility appropriate with sequence of operations required in each project area or typical space type. A single platform shall be used for indoor lighting controls.
  3. Lighting control zones shall be networked with a higher-level system backbone to provide time-based control, remote control from inputs and/or systems external to the control zone.
  4. All system devices shall support remote firmware update, such that physical access to each device is not necessary, for purposes of upgrading functionality later.
  5. System shall be capable of "out of box" sequence of operation for each control zone. Standard sequence is:
    - a. All switches control all fixtures in a zone
    - b. All occupancy sensors automatically control all fixtures in the control zone with a default timeout.
- B. Wired Networked Control Zone Characteristics
1. All networked devices connected with low voltage network cable shall automatically form a functional lighting control zone without requiring any type of programming, regardless of the programming mechanism (e.g., software application, handheld remote, pushbutton). The "out of box" default sequence of operation is intended to provide typical sequence of operation to minimize the system startup and programming requirements and to also have functional lighting control operation prior to system startup and programming.
  2. System shall be able to automatically discover all connected devices without requiring any provisioning of system or zone addresses.
  3. The following types of wired networked control devices shall be provided for egress and/or emergency light fixtures:
    - a. Low-Voltage power sensing: These devices shall automatically provide 100% light level upon detection of loss of power sensed via the low voltage network cable connection.
    - b. UL924 Listed Line-Voltage power sensing: These devices shall be listed as emergency relays under the UL924 standard and shall automatically close the load control relay(s) and provide 100% light output upon detection of loss of power sensed via line voltage connections.
    - c. Emergency egress devices shall be provided, and UL labeled by the lighting control manufacturer.
- C. Wireless Networked Control Zone Characteristics
1. All wireless networked devices paired, meshed or grouped together shall automatically follow the "out of box" default sequence of operations.

2. Wireless network communication shall support uniform and instant response such that all luminaires in a lighting control zone respond immediately and synchronously in response to a sensor or wall station signal.
  3. To support the system architecture requirement for distributed intelligence, wireless network communication shall support communication of control signals from sensors and wall stations to networked luminaires and wireless load control devices, without requiring any communication, interpretation, or translation of information through a backbone device such as a wireless access point, communication bridge or gateway.
  4. All wireless communication shall be encrypted using at least 128-bit Advanced Encryption Standard (AES).
  5. The following types of wired networked control devices shall be provided for egress and/or emergency light fixtures:
    - a. UL924 Listed Line-Voltage power sensing: These devices shall be listed as emergency relays under the UL924 standard and shall automatically close the load control relay(s) and provide 100% light output upon detection of loss or interruption of power sensed via line voltage connections.
- D. System Integration Capabilities
1. The system shall be capable of interface with third party building management systems (BMS) to support two-way communication using the industry standard BACnet/IP or BACnet/MSTP protocols.
    - a. Systems utilizing a third-party converter or systems that require a dedicated server to achieve integration are not acceptable.

## **2.03 SYSTEM SOFTWARE INTERFACES**

- A. Management Interface
1. System shall provide a web-based management interface that provides remote system control, live status monitoring, and configuration capabilities of lighting control settings and schedules.
  2. Management interface must be compatible with industry-standard web browser clients, including, but not limited to, Microsoft Internet Explorer®, Apple Safari®, Google Chrome®, Mozilla Firefox®.
  3. All system software updates must be available for automatic download and installation via the internet.
- B. Historical Database and Analytics Interface
1. System shall provide a browser-based trending and monitoring interface that stores historical data for all occupancy/daylight sensors and lighting loads. Additionally, the system shall optionally upload that data to a cloud-based server.
- C. Visualization Interfaces
1. System shall provide an optional web-based visualization interface that displays a graphical floorplan. System data, to include status of occupancy sensors, daylight sensors and light output shall be overlaid to the floorplan to provide a graphical status page.
- D. Portable Programming Interface for Standalone Control Zones
1. Portable handheld application interface for standalone control zones shall be provided for systems that allows configuration of lighting control settings.
  2. Programming capabilities through the application shall include, but not be limited to, the following:
    - a. Switch, occupancy and photo sensor group configuration
    - b. Manual/automatic on modes
    - c. Turn-on dim level
    - d. Occupancy sensor time delays
    - e. Dual technology occupancy sensors sensitivity
    - f. Photo-sensor calibration adjustment and auto-setpoint
    - g. Trim level settings

## **2.04 WIRED NETWORKED DEVICES**

- A. Wired Networked Wall Switches, Dimmers, Scene Controllers
1. Wall switches & dimmers shall support the following device options:
    - a. Number of control zones: 1, 2 or 4. Gang multiple switches where more than 4 control zones are required in a single location under a single faceplate.
    - b. Control Types Supported: On/Off or On/Off/Dimming
  2. Scene controllers shall support the following device options:
    - a. Number of scenes: 1, 2 or 4
    - b. Control Types Supported:
      - 1) On/Off or On/Off/Dimming
      - 2) Preset Level Scene Type
      - 3) Reprogramming of other devices within daisy-chained zone so as to implement user selected lighting scene
      - 4) Selecting a lighting profile to be run by the system's upstream controller to implement a selected lighting profile across multiple zones
  3. Match color specified in Division 26 Section "Wiring Devices."
  4. Integral green LED pilot light to indicate when circuit is on.
  5. Internal white LED locator light to illuminate when circuit is off.
  6. Networked switch stations shall have backlit buttons.
  7. Wall Plates:
    - a. Single and multi-gang plates as specified in Division 26 Section "Wiring Devices."
    - b. Where multiple switches and/or dimmers are adjacent to each other, install a single cover plate. Provide separate boxes or barriers as required for the application.
    - c. Provide cover plates that are identical in material and dimension to standard single and double gang switch plates.
    - d. Verify back box requirements for multiple control points with manufacturer.
  8. Legend: Engraved or permanently silk-screened on wall plate where indicated. Use designations indicated on Drawings.
  9. Auxiliary Input/output Devices shall be specified as an input or output device with the following options:
    - a. Contact closure input: Programmable to support maintained or momentary inputs that can activate local or global scenes and profiles, ramp light level up or down, or toggle lights on/off.
    - b. 0-10V analog input: Programmable to function as a daylight sensor.
    - c. RS-232/RS-485 digital input: Supports activation of up to 4 local or global scenes and profiles, and on/off/dimming control of up to 16 local control zones.
    - d. 0-10V dimming control output, capable of sinking a minimum of 20mA of current programmable to support all standard sequence of operations supported by system.
- B. Wired Networked Occupancy and Photosensors
1. Sensors shall utilize passive infrared (PIR) or passive dual technology (PDT) to detect both major and minor motion as defined by NEMA WD-7 standard.
  2. Sensing technologies that are acoustically passive, meaning they do not transmit sound waves of any frequency do not require additional commissioning. Ultrasonic or Microwave based sensing technologies may require commissioning due to the active nature of their technology, if factory required.
  3. Sensor programming parameter shall be available and configurable remotely from the software and locally via the device.
  4. Sensor mounting type shall match project design requirements as shown on plans.
    - a. Sensors shall have optional features for photosensor/daylight override, dimming control, and low temperature/high humidity operation.
  5. The system shall support the following types of photocell-based control:
    - a. On/Off: The control zone is automatically turned off if the photocell reading exceeds the defined setpoint and automatically turned on if the photocell reading is below the defined setpoint. A time delay or adaptive setpoint adjustable behavior may be used to prevent the system from exhibiting nuisance on/off switching.

- b. Continuous Dimming: The control zone automatically adjusts its dimming output in response to photocell readings, such that a minimum light level consisting of both electric light and daylight sources is maintained at the task. The photocell response shall be configurable to adjust the photocell setpoint and dimming rates.
- C. Wired Networked Wall Switch Sensors
  - 1. Wall switches sensors shall support the following device options:
    - a. User Input Control Types Supported: On/Off or On/Off/Dimming
    - b. Occupancy Sensing Technology: PIR only or Dual Tech
    - c. Daylight Sensing Option: Inhibit Photosensor
- D. Distributed System Power, Switching and Dimming Controls
  - 1. Devices shall incorporate one optional Class 1 relay, optional 0-10 VDC dimming output, and contribute low voltage Class 2 power to the rest of the system.
  - 2. Device programming parameters shall be available and configurable remotely from the software and locally via the device push-button.
  - 3. Device shall be plenum rated.
  - 4. Devices shall be UL Listed for load and load type as specified on the plans.

## **2.05 WIRELESS NETWORKED DEVICES**

- A. Wireless Networked Sensor Interface
  - 1. The device shall be capable of broadcasting the following manual wall control commands: on, off, and adjust dim level.
- B. Wireless Networked Light Controllers (No Sensor)
  - 1. The wireless light controller shall be capable of providing continuous dimming and on/off control of one commercial light fixture including fluorescent, HID, induction and LEDs.
  - 2. An external antenna attached to the luminaire shall not be allowed.
    - a. Each wireless light controller shall provide measurement capability of the amperage, voltage, wattage, and watt-hours of its controlled lighting.
- C. Wireless Networked Digital Sensors
  - 1. In addition to providing Wireless Networked Light Controllers functionality, also provides:
    - a. Integrated digital occupancy sensing and digital photocell sensor.
    - b. Sensor shall connect directly to the wireless light controller.
    - c. Sensor shall have software-adjustable settings
    - d. Photocell shall be suitable for closed and open loop applications.
- D. Wireless Network Communication Bridge
  - 1. A communication bridge device shall be provided that interfaces with the System Controller via Owner's LAN connection and interfaces with wireless network.
  - 2. Device shall be capable of communicating with a group of a minimum of 250 wireless networked devices and luminaires, to reduce the amount of communication bridges required in the system.

## **2.06 CONDUCTORS AND CABLES**

- A. General: All conductors and cables shall comply with the requirements of Division 26 Section "Conductors and Cables." Where cable is permitted to be installed exposed in ceiling space, provide plenum rated cable.
- B. Power Wiring to Supply Side of Class 2 Power Source: Not smaller than No. 12 AWG.
- C. Classes 2 and 3 Control Cables: Multi-conductor cable with copper conductors not smaller than No. 22 AWG.
- D. Class 1 Control Cables: Multi-conductor cable with copper conductors not smaller than No. 18 AWG.
- E. Digital and Multiplexed Signal Cables: As required by system manufacturer. Provide plenum rated cables where installed exposed in ceiling space.

## **PART 3 - EXECUTION**

### **3.01 WIRING INSTALLATION**

- A. The lighting control system shall be installed and connected as shown on the plans and as directed by the manufacturer.
- B. Comply with NECA 1.
- C. Wiring Method: Install wiring in raceways except where installed in accessible ceilings. Comply with Division 26 Sections "Conductors and Cables" and "Raceways and Boxes".
- D. Where cables are installed in finished areas with exposed construction, conceal cables from view. Route at top of structural systems and conceal on top of structural members where possible. Where cable is exposed to view, provide raceway. As an alternative to raceway, provide cable that is factory colored to match exposed ceiling. Submit sample to Architect for approval.
- E. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.
- F. Install field-mounting transient voltage suppressors for lighting control devices in Category A locations that do not have integral line-voltage surge protection.
- G. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- H. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in terminal cabinets, equipment enclosures, and in junction, pull, and outlet boxes as per manufacturers' recommendations.
- I. Identify components and power and control wiring according to Division 26 Section "Electrical Identification."
- J. Label each relay with a unique designation.

### **3.02 INSTALLATION REQUIREMENTS**

- A. Review all required installation and pre-startup procedures with the manufacturer's representative through pre-construction meetings.
- B. Install and connect the networked lighting control system components according to the manufacturer's installation instructions, wiring diagrams, the project submittals, plans and specifications.
- C. Coordination with Owner's IT Network Infrastructure to secure all required network connections to the owner's IT network infrastructure. Provide the owner's representative with all network infrastructure requirements of the networked lighting control system. Provide the manufacturer's representative with all necessary contacts pertaining to the owner's IT infrastructure, to ensure that the system is properly connected and started up.
- D. Verify integration and interoperability scope with the Mechanical Contractor prior to submittal phase and provide all necessary schedules to the Lighting Control manufacturer.

### **3.03 SYSTEM STARTUP**

- A. Upon completion of installation by the installer, including completion of all required verification and documentation required by the manufacturer, the system shall be started up and programmed by an authorized representative of the manufacturer.
  - 1. Low voltage network cable testing shall be performed prior to system startup at the discretion of the manufacturer.
- B. System start-up and programming shall include:
  - 1. Verifying operational communication to all system devices.
  - 2. Programming the network devices into functional control zones to meet the required sequence of operation.
  - 3. Programming and verifying all sequence of operations.
  - 4. Customization of owner's software interfaces and applications.
- C. Initial start-up and programming are to occur on-site. Additional programming may occur on-site or remotely over the Internet as necessary.

**3.04 DOCUMENTATION**

- A. Submit software database file with desired device labels and notes completed.
- B. Document the installed location of all networked devices, including networked luminaires. Provide as-built plan drawing showing device addresses corresponding to locations of installed equipment.

**3.05 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components and equipment installation, including connections and assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
  - 1. Test for circuit continuity.
  - 2. Verify that the control module features are operational.
  - 3. Check operation of local override controls.
  - 4. Test system diagnostics by simulating improper operation of several components selected by Architect.

**3.06 SYSTEM COMMISSIONING**

- A. Facilitate the functional testing and verification of the lighting control system by an independent, third party commissioning agent.
- B. Perform commissioning in the presence of the Owner's representative.
- C. Submit functional test plan checklist signed by the commissioning agent.

**3.07 ADJUSTING**

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting programming functions and other system parameters and to assist Owner's personnel in making program changes to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

**3.08 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to program, adjust, operate, and maintain lighting controls.
- B. Demonstration shall be done only after initial system start-up setup has occurred and system is functioning properly.
- C. Demonstration shall consist of a four-hour minimum session.

**3.09 MANUFACTURER SUPPORT**

- A. Manufacturer telephone support shall be available at no cost to the Owner during the warranty period and shall include the following:
  - 1. Assistance in solving programming or other application issues pertaining to the control equipment.
  - 2. The manufacturer shall provide a toll-free number for direct technical support available 7 days a week, 24 hours a day.
  - 3. A factory authorized technician shall be located within a 100-mile radius of the project site.

**END OF SECTION 26 0943**

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Distribution panelboards.
  - 2. Lighting and appliance branch-circuit panelboards.

#### 1.03 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. GFEP: Ground-fault equipment protection.
- D. AFCI: Arc-fault circuit interrupter.
- E. RFI: Radio-frequency interference.
- F. RMS: Root mean square.
- G. SPDT: Single pole, double throw.

#### 1.04 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, surge protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Related Submittals:
  - 1. Provide overcurrent device coordination study to demonstrate proper overcurrent device ratings, adjustments, and settings.
- C. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
  - a. Enclosure types and details for types other than NEMA 250, Type 1.
  - b. Bus configuration, current, and voltage ratings.
  - c. Short-circuit current rating of panelboards and overcurrent protective devices.
  - d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
2. Wiring Diagrams: Power, signal, and control wiring.
- D. Field quality-control test reports including the following:
  1. Test procedures used.
  2. Test results that comply with requirements.
  3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- E. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
- F. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1, include the following:
  1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
  2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

#### **1.05 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.
  1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of panelboards and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Comply with NEMA PB 1.
- F. Comply with NFPA 70.

#### **1.06 PROJECT CONDITIONS**

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
  1. Ambient Temperature: Not exceeding 104 deg F.
  2. Altitude: Not exceeding 6600 feet.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
  1. Ambient temperatures within limits specified.
  2. Altitude not exceeding 6600 feet.
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of electrical service.

2. Do not proceed with interruption of electrical service without Construction Manager's written permission.

#### **1.07 COORDINATION**

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.

#### **1.08 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Keys: Six spares for each type of panelboard cabinet lock.

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
    - a. Square D. (Basis of Design)
    - b. Eaton Corporation; Cutler-Hammer Products.

#### **2.02 MANUFACTURED UNITS**

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- B. Enclosures: Mounting as noted on panel schedules. NEMA PB 1, Type 1.
  1. Rated for environmental conditions at installed location.
    - a. Outdoor Locations: NEMA 250, Type 3R.
    - b. Other Wet or Damp Indoor Locations: NEMA 250, Type 4X.
  2. Cabinet Front: Flush or surface cabinet as noted on the Drawings.
    - a. Square D – Continuous piano hinge trim.
    - b. Eaton LTDD (Piano hinge trim)
  3. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
  4. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.
- C. Phase and Ground Buses:
  1. Material: Hard-drawn copper, 98 percent conductivity.
  2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
- D. Conductor Connectors: Suitable for use with conductor material.
  1. Main and Neutral Lugs: Mechanical type.
  2. Ground Lugs and Bus Configured Terminators: Compression type.
  3. Feed-Through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
  4. Double Lugs: Mechanical type mounted at location of main incoming lugs.
- E. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.
- F. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.
- G. Surge Protective Devices:
  1. Manufacturer: Environmental Potentials
  2. Where indicated, provide manufactured units with direct bus connected type as specified in Division 26 Section "Surge Protective Devices."

3. Provide Surge Protective Device for all Distribution and Branch Circuit Panelboards that are part of the Emergency Distribution System.
4. Provide Surge Protective Devices elsewhere where indicated on the drawings.

## **2.03 PANELBOARD SHORT-CIRCUIT RATING**

- A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

## **2.04 DISTRIBUTION PANELBOARDS**

- A. Main bus bars, neutral and ground, shall be aluminum and sized in accordance with U.L. Standards to limit temperature rise on any current carrying part to the maximums as indicated in UL67.
- B. Doors: Secured with vault-type latch with tumbler lock; keyed alike. Omit for fused-switch panelboards.
- C. Main Overcurrent Protective Devices: Circuit breaker.
- D. Branch Overcurrent Protective Devices:
  1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
  2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
  3. Fused switches.

## **2.05 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS**

- A. Main bus bars, neutral and ground, shall be sized in accordance with U.L. Standards to limit temperature rise on any current carrying part to the maximums as indicated in UL67.
- B. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

## **2.06 OVERCURRENT PROTECTIVE DEVICES**

- A. Molded-Case Circuit Breaker: NEMA AB 3, with interrupting capacity to meet available fault currents.
  1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits.
    - a. Circuit Breakers 250A and Larger: Magnetic trip element with front-mounted, field-adjustable trip setting with restricted access cover.
  2. Electronic trip-unit circuit breakers shall have RMS sensing; field-replaceable rating plug; and with the following field-adjustable settings with restricted access cover:
    - a. Instantaneous trip.
    - b. Long- and short-time pickup levels.
    - c. Long- and short-time time adjustments.
    - d. Ground-fault pickup level, time delay, and  $I^2t$  response.
  3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
  4. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
  5. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
  6. AFCI Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
- B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
  1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
  2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
  3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

4. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Division 26 Section "Electrical Power Monitoring and Control."
  5. Shunt Trip: 120-V trip coil energized from separate circuit.
  6. Do not use tandem circuit breakers.
  7. Provide lock on devices for circuit breakers when called out on panel schedules with "LOD" designation.
  8. Provide type GFEP circuit breakers for all self-regulating heating (snow melting and heat trace) cables branch circuits and where noted on panel schedules with "GFEP" designation
  9. Provide GFCI circuit breaker when called out on panel schedules with "GFCI" designation.
  10. Provide Arc-Fault Circuit Interrupters where indicated on panel schedule with "AFCI" designation.
  11. Provide shunt trip breakers when called out on panel schedules with "STB" designation.
  12. Provide smart controllable circuit breakers when called out on panel schedules with "SMT" designation.
  13. Provide permanent padlockable handle for circuit breakers when called out on panel schedules with "PL" designation.
- C. Circuit Breaker Selection for Transformer Primary Protection:
1. Circuit Breaker Selection for Transformer Primary Protection: Provide circuit breakers with time-current characteristics to clear transformer inrush currents while still providing protection for the ANSI through-fault protection curve. Provide circuit breakers with adjustable magnetic trip or electronic trip units as necessary to provide time-current curve shaping to achieve long time trip indicated on drawings, inrush coordination and damage protection.

## **2.07 ACCESSORY COMPONENTS AND FEATURES**

- A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Provide permanent provisions for padlocking all overcurrent devices in Distribution Panelboards. Provisions shall remain in place whether or not lock is installed.
- C. Provide permanent provisions for padlocking overcurrent devices in Branch Circuit Panelboards that serve equipment not provided with a local, lockable disconnecting means. Provisions shall remain in place whether or not lock is installed

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- C. Mount top of trim 74 inches above finished floor, unless otherwise indicated.
- D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- E. Install overcurrent protective devices and controllers.
  1. Set field-adjustable switches and circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.
- G. Stub four 1-inch empty conduits from recessed panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- H. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

### **3.02 IDENTIFICATION**

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Electrical Identification."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads or created by retrofitting. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable. Coordinate final directory room names and numbers with Owner.
- C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

### **3.03 CONNECTIONS**

- A. Ground equipment according to Division 26 Section "Grounding and Bonding."
- B. Connect wiring according to Division 26 Section "Conductors and Cables."

### **3.04 FIELD QUALITY CONTROL**

- A. Prepare for acceptance tests as follows:
  - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- B. Testing: Perform the following field quality control tests in accordance with Division 26 section "Electrical Testing"
  - 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters. Perform electrical tests on all breakers and switches 200A and above or that constitute a component of an emergency distribution system. Main circuit breakers in branch circuit panelboards 225A and below are not required to be tested.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
  - 1. Measure as directed during period of normal system loading.
  - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
  - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
  - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.
- D. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scanning of each panelboard. Remove panel fronts so joints and connections are accessible to portable scanner.
  - 1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  - 2. Record of Infrared Scanning: Prepare a certified report that identifies panelboards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

- E. Testing and Certification (Isolation Power Panels)
  - 1. Provide manufacturer's engineer or technician for final testing of Isolated Power Panel and the related system as follows.
    - a. Simulate faults at each receptacle to ascertain correct function of the L.I.M.
    - b. Check the calibration of the L.I.M. meter and record readings.
    - c. Record and date all data in permanent log book.
    - d. Certify that the system is properly installed and in correct working order.
    - e. Turn over to the hospital maintenance department a set of test equipment consisting of a ground integrity tester, current leakage tester, and plug in the L.I.M. tester.

**3.05 CLEANING**

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

**END OF SECTION 26 2416**

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## SECTION 26 2726 - WIRING DEVICES

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### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Single and duplex receptacles
  - 2. Receptacles with integral USB charger.
  - 3. Ground-fault circuit interrupter receptacles
  - 4. Controlled receptacles.
  - 5. Single- and double-pole snap switches.
  - 6. Device wall plates.
  - 7. Floor service fittings

#### 1.03 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. AFCI: Arc-fault circuit interrupter.
- D. PVC: Polyvinyl chloride.
- E. RFI: Radio-frequency interference.
- F. SPD: Surge protective devices.
- G. UTP: Unshielded twisted pair.
- H. USB: Universal serial bus.

#### 1.04 REFERENCES

- A. DSCC W-C-596G: Federal Specification Connector, Electrical, Power, General Specification.

- B. DSCC W-C-896F: Federal Specification Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification).
- C. IEC 309-1, Part 1: General Requirements: Plugs, Socket-Outlets and Couplers for Industrial Purposes
- D. NEMA FB 11: Plugs, Receptacles, and Connectors of the Pin and Sleeve Type for Hazardous Locations.
- E. NEMA WD 1: General Requirements for Wiring Devices.
- F. NEMA WD 6: Wiring Device – Dimensional Requirements.
- G. UL 20: General-Use Snap Switches.
- H. UL 486A: Wire Connectors and Soldering Lugs for Use with Copper Conductors.
- I. UL 498: Electrical Attachment Plugs and Receptacles.
- J. UL 943: Ground Fault Circuit Interrupters.
- K. NECA 130-2010: Installing and Maintaining Wiring Devices.

#### **1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations for each type of product indicated.

#### **1.06 QUALITY ASSURANCE**

- A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

#### **1.07 COORDINATION**

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
  - 1. Cord and Plug Sets: Match equipment requirements.

### **PART 2 PRODUCTS**

#### **2.01 GENERAL WIRING DEVICE REQUIREMENTS**

- A. Comply with NFPA 70, NEMA WD 1, NEMA WD 6, and UL498.
- B. Devices for Owner-Furnished Equipment:
  - 1. Receptacles: Match plug configurations.
  - 2. Cord and Plug Sets: Match equipment requirements.
- C. Device Color:
  - 1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70 or device listing.
  - 2. Wiring Devices Connected to Emergency Power System: Red.
  - 3. Wiring Devices Connected to Optional Standby Power System: Red.
  - 4. Wall Switches: As selected by Architect, unless otherwise indicated.

#### **2.02 INDUSTRIAL-GRADE RECEPTACLES**

- A. Duplex Receptacle, NEMA 5-20R:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Hubbell Wiring Device-Kellems: HBL 5362
    - b. Eaton/Arrow Hart Wiring Devices: AH5362
    - c. Leviton: 5362
    - d. Legrand, Pass & Seymour: 5362A
- B. Industrial Heavy-Duty Pin and Sleeve Devices: Comply with IEC 309-1.

## **2.03 GFCI RECEPTACLES**

- A. General:
  - 1. Comply with UL 943
- B. Duplex GFCI Receptacle, NEMA 5-20R:
  - 1. Manufacturers: Subject to compliance with requirements, provide one of the following:
    - a. Hubbell Wiring Device-Kellems: GFRST20
    - b. Eaton/Arrow Hart Wiring Devices: SGF20
    - c. Leviton: GFNT2
    - d. Legrand, Pass & Seymour: 2097
- C. Tamper-Resistant Duplex GFCI Receptacle, NEMA 5-20R:
  - 1. Safety mechanism to energize contacts only when both openings are simultaneously engaged.
  - 2. Manufacturers: Subject to compliance with requirements, provide one of the following:
    - a. Hubbell Wiring Device-Kellems: GFTRST20
    - b. Eaton/Arrow Hart Wiring Devices: TRSGF20
    - c. Leviton: GFTR2
    - d. Legrand, Pass & Seymour: 2097TR
- D. Tamper- and Weather-Resistant Duplex GFCI Receptacle, NEMA 5-20R:
  - 1. Safety mechanism to energize contacts only when both openings are simultaneously engaged.
  - 2. Manufacturers: Subject to compliance with requirements, provide one of the following:
    - a. Hubbell Wiring Device-Kellems: GFTWRST20
    - b. Eaton/Arrow Hart Wiring Devices: TWRSGF20
    - c. Leviton: GFWT2
    - d. Legrand, Pass & Seymour: 2097TRWR
- E. Weather-Resistant Duplex GFCI Receptacle, NEMA 5-20R:
  - 1. Comply with UL 943.
  - 2. Manufacturers: Subject to compliance with requirements, provide one of the following:
    - a. Eaton/Arrow Hart Wiring Devices WRSGF20
    - b. Leviton: GFWR2
    - c. Legrand, Pass & Seymour: 2097TRWR

## **2.04 STRAIGHT BLADE AND TWIST-LOCK RECEPTACLES, OTHER THAN NEMA 5-20R**

- A. Provide commercial specification grade straight blade and twist-lock receptacles with standard NEMA configurations in accordance with the "Special Receptacles" schedule included on the drawings.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Hubbell Wiring Device-Kellems
  - 2. Eaton/Arrow Hart Wiring Devices
  - 3. Leviton
  - 4. Legrand, Pass & Seymour

## **2.05 CORD AND PLUG SETS**

- A. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
- B. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
- C. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

## **2.06 WALL SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Hubbell Wiring Device-Kellems: 1220 Series

2. Eaton/Arrow Hart Wiring Devices: AH1220 Series
3. Leviton: 1220 Series
4. Legrand, Pass & Seymour: PS20AC Series
- B. Device body: Plastic handle.
- C. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.
- D. Snap Switches: Heavy Duty specification grade, quiet type; rated 20A., 120-277 V AC.
- E. Provide single-pole, two-pole, three-way and four-way switches as indicated.
- F. Provide key type where indicated. Furnish four keys to Owner.
- G. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.
  1. Switch: 20 A, 120/277-V ac.
  2. Receptacle: NEMA WD 6, Configuration 5-20R.

## **2.07 WALL PLATES**

- A. Manufacturers:
  1. Provide wall plates and corresponding wiring devices from same manufacturer.
- B. Single and combination types to match corresponding wiring devices.
  1. Plate-Securing Screws: Metal with head color to match plate finish.
  2. Material for Finished Spaces:
    - a. 0.035-inch-thick, satin-finished stainless steel
  3. Material for Unfinished Spaces:
    - a. Galvanized steel
  4. Material for Wet Locations: Gasketed Cast aluminum with hinged cover and listed and labeled as Extra Duty Weatherproof While-In-Use.
    - a. Manufacturers:
      - 1) Red Dot Model: CKLSVU, Thomas & Betts
      - 2) Intermatic: WP3110MXD
      - 3) Leviton: IUM1V
  5. Material for Damp Locations: Gasketed Cast aluminum with hinged cover and listed and labeled as Weatherproof.
    - a. Manufacturers:
      - 1) Red Dot Model CCGV, ABB Installation Products
      - 2) Eaton/Arrow Hart WLRD1
      - 3) Legrand, Pass & Seymour
      - 4) Intermatic: WP3110MXD

## **2.08 FLOOR SERVICE FITTINGS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Hubbell Wiring Device-Kellems
  2. Legrand, Wiremold
  3. Steel City
- B. Refer to Floor Service Fitting Schedule on Plan.
- C. Compartments: Provide barrier separating power from telecommunications cabling. Provide recessed-type floor service fittings with independent compartments and feed through wiring capability.
- D. Provide a blank bracket for any unused gangs.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Prior to installation of devices, verify wall openings are neatly cut and will be completely covered by wall plates, clean debris from outlet boxes and provide extension rings to bring outlet boxes flush with finished surface.

- C. Install devices and assemblies level, plumb, and square with building lines.
- D. Arrangement of Devices:
  - 1. Coordinate locations of outlet boxes provided under Division 26 Section "Raceways and Boxes" to obtain mounting heights indicated on Drawings.
  - 2. Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top.
  - 3. Where multiple switches, dimmers, and/or occupancy sensors are adjacent to each other, provide a single cover plate. Custom fabricate, if required, for all combinations. Provide separate boxes or barriers as required for the application.
  - 4. Install horizontally mounted receptacles with grounding pole on the left.
  - 5. Install GFCI receptacles so that the "Push To Test" and "Reset" designations can be read correctly. If printed in both directions, install with ground pole on top.
  - 6. Install switches with OFF position down.
- E. Install cover plates on switch, receptacle, and blank outlets in finished areas.
- F. Install weather-resistant type receptacles in all damp and wet locations, including pool environments.
- G. Install weatherproof cover plates on receptacles in damp locations.
- H. Install weatherproof While-In-Use cover plates on receptacles in wet locations.
- I. Install tamper-resistant type receptacles in all locations as required by the NEC (406.12) and as indicated on plan.
- J. Use oversized 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. Remove wall plates and protect devices and assemblies during painting.
- M. Install properly oriented access floor boxes into cutouts in access floor tiles and secure to tiles per Manufacturer's instructions.
- N. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.
- O. Adjust devices and wall plates to be flush and level. Three corners of wall plates must be in contact with wall surfaces. Devices shall be solidly mounted against the box.

### **3.02 IDENTIFICATION**

- A. Comply with Division 26 Section "Electrical Identification."
  - 1. Receptacles: Identify panelboard and circuit number from which served. Use adhesive label as specified in Division 26 Section "Electrical Identification" with black-filled lettering on face of wall plate, and durable wire markers or tags inside outlet boxes.
  - 2. Wall Switches: Identify panelboard and circuit number from which served. Use adhesive label as specified in Division 26 Section "Electrical Identification" with black-filled lettering on face of wall plate, and durable wire markers or tags inside outlet boxes.

### **3.03 CONNECTIONS**

- A. Ground equipment according to Division 26 Section "Grounding and Bonding." Connect wiring device grounding terminal to outlet box with bonding jumper. Use of quick ground strap or screw is not acceptable.
- B. Connect wiring according to Division 26 Section "Conductors and Cables." Connect wiring devices by wrapping conductor around screw terminal or by using back wiring and tightening the screw securely.
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

**3.04 FIELD QUALITY CONTROL**

- A. Perform the following field tests and inspections and prepare test reports:
  - 1. Inspect each wiring device for defects.
  - 2. Operate each wall switch with circuit energized and verify proper operation.
  - 3. After installing wiring devices and after electrical circuitry has been energized, test each receptacle for proper polarity, ground continuity, and compliance with requirements.
  - 4. Test each GFCI receptacle for proper operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

**END OF SECTION 26 2726**

## SECTION 26 2816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

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### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  - 1. Division 26 Section "Fuses".

#### 1.02 SUMMARY

- A. This Section includes the following individually mounted, enclosed switches and circuit breakers:
  - 1. Fusible switches.
  - 2. Nonfusible switches.
  - 3. Molded-case circuit breakers.
  - 4. Molded-case switches.
  - 5. Enclosures.
- B. Related Sections:
  - 1. Division 26 "Hangers and Supports for Electrical Systems" for concrete bases.

#### 1.03 DEFINITIONS

- A. GD: General duty.
- B. GFCI: Ground-fault circuit interrupter.
- C. HD: Heavy duty.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.

#### **1.04 REFERENCES**

- A. NECA 1: Practices for Good Workmanship in Electrical Contracting.
- B. NETA ATS: Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- C. NEMA 250: Enclosures for Electrical Equipment (1000 Volts Maximum).
- D. NEMA AB 1: Molded Case Circuit Breakers and Molded Case Switches.
- E. NEMA FU 1: Low Voltage Cartridge Fuses.
- F. NEMA KS 1: Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- G. NEMA PB1.1: General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.
- H. NEMA PB2.1: General Instructions for Proper Installation, Operation, and Maintenance of Deadfront Switchboards Rated 600 Volts or Less.
- I. NFPA 70: National Electrical Code.

#### **1.05 SUBMITTALS**

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
  - 1. Enclosure types and details for types other than NEMA 250, Type 1.
  - 2. Current and voltage ratings.
  - 3. Short-circuit current rating.
  - 4. UL listing for series rating of installed devices.
  - 5. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Qualification Data: For testing agency.
- D. Field quality-control test reports including the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- E. Manufacturer's field service report.
- F. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Closeout Procedures," include the following:
  - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
  - 2. Time-current curves, including selectable ranges for each type of circuit breaker.

#### **1.06 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
  - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.
- D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.



**1.07 PROJECT CONDITIONS**

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
  2. Altitude: Not exceeding 6600 feet.

**1.08 COORDINATION**

- A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

**1.09 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Spares: For the following:
    - a. Potential Transformer Fuses: 2 of each size and type.
    - b. Control-Power Fuses: 2 of each size and type
    - c. Fuses for Fusible Switches: Equal to 10 percent of amount installed for each size and type, but no fewer than 3 of each size and type.
  2. Spare Indicating Lights: Six of each type installed.

**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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

**2.02 FUSIBLE AND NONFUSIBLE SWITCHES**

- A. Manufacturers:
1. Square D/Group Schneider. (Basis of Design).
  2. Eaton Corporation; Cutler-Hammer Products.
- B. Fusible Switch: NEMA KS 1, quick make, quick-break load interrupter enclosed knife switch Type HD, with clips or bolt pads to accommodate specified fuses, externally operable lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Nonfusible Switch: NEMA KS 1, quick make, quick-break load interrupter enclosed knife switch Type HD, externally operable lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- D. Accessories:
1. Provide early break auxiliary contacts in motor disconnect switches for motors that are fed from variable frequency controllers.
  2. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  3. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
  4. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

**2.03 TOGGLE DISCONNECT SWITCH**

- A. Manufacturers:
1. Double Pole:
    - a. Hubbell 1372.
    - b. Leviton 6808G-DAC.

- c. Pass & Seymour 7812.
    - d. Bryant 30102.
  - 2. Three Pole:
    - a. Hubbell 1379.
    - b. Leviton 7810GD.
    - c. Pass & Seymour 7813.
    - d. Bryant 30103.
- B. Description: Heavy duty, 30A, 600 volt, double or three pole as required, single throw, motor rated switch without overload protection. Provide NEMA 1 enclosure and padlock attachment.

## **2.04 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES**

- A. Manufacturers:
  - 1. Square D/Group Schneider (Basis of Design).
  - 2. Eaton Corporation; Cutler-Hammer Products.
- B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
  - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  - 3. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
    - a. Instantaneous trip.
    - b. Long- and short-time pickup levels.
    - c. Long- and short-time time adjustments.
    - d. Ground-fault pickup level, time delay, and I<sup>2</sup>t response.
  - 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
  - 5. GFCI Circuit Breakers: Single- and two-pole configurations with 5 or 30-mA trip sensitivity as required.
- C. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
  - 1. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
  - 2. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
  - 3. Enclosure: Provide handle capable of being locked in the open position with padlock.
  - 4. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
  - 5. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Division 26 Section "Electrical Power Monitoring and Control."
  - 6. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
  - 7. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
  - 8. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
- D. Molded-Case Switches: Molded-case circuit breaker with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.
- E. Molded-Case Switch Accessories:
  - 1. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
  - 2. Application Listing: Type HACR for heating, air-conditioning, and refrigerating equipment.
  - 3. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage. Provide "dummy" trip unit where required for proper operation.

4. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay. Provide "dummy" trip unit where required for proper operation.
  5. Key Interlock Kit: Externally mounted to prohibit operation; key shall be removable only when switch is in off position.
  6. Circuit breaker selection for primary
- F. Circuit Breaker Selection for Transformer Primary Protection: Provide circuit breakers with time-current characteristics to clear transformer inrush currents while still providing protection for the ANSI through-fault protection curve. Provide circuit breakers with adjustable magnetic trip or electronic trip units as necessary to provide time-current curve shaping to achieve long time trip indicated on drawings, inrush coordination and damage protection.

## **2.05 ENCLOSURES**

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
1. Indoor Dry Locations: NEMA 250, Type 1.
  2. Outdoor Locations: NEMA 250, Type 3R.
  3. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
  4. Other Wet or Damp Indoor Locations: NEMA 250, Type 4X.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 CONCRETE BASES**

- A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.
- B. Concrete base is specified in Division 26 Section "Hangers and Supports for Electrical Systems," and concrete materials and installation requirements are specified in Division 3.

### **3.03 INSTALLATION**

- A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.
- B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.
- C. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- D. Install switches with off position down.
- E. Install NEMA KS 1 enclosed switch where indicated for motor loads  $\frac{1}{2}$  HP and larger and equipment loads greater than 30A.
- F. Install toggle disconnect switch, surface mounted, where indicated for motor loads less than  $\frac{1}{2}$  HP and equipment loads 30A. and less.
- G. Install fuses in fusible disconnect switches.
- H. Install flexible liquid tight conduit from toggle disconnect switch to portable equipment. Leave a 6'-0" whip.
- I. Install flexible liquid tight conduit from toggle disconnect switch to stationary equipment.
- J. Install control wiring from early break contacts in motor disconnect switch to variable frequency controllers to shut down controller when switch is open.
- K. Install equipment on exterior foundation walls at least one inch from wall to permit vertical flow of air behind breaker and switch enclosures.
- L. Support enclosures independent of connecting conduit or raceway system.
- M. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

### **3.04 IDENTIFICATION**

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Electrical Identification."
- B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 26 Section "Electrical Identification."
- C. Provide adhesive label as specified in Division 26 Section "Electrical Identification" on inside door of each switch indicating UL fuse class and size for replacement.

### **3.05 FIELD QUALITY CONTROL**

- A. Prepare for acceptance testing as follows:
  - 1. Inspect mechanical and electrical connections.
  - 2. Verify switch and relay type and labeling verification.
  - 3. Verify rating of installed fuses.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- C. Perform the following field tests and inspections and prepare test reports:
  - 1. Test mounting and anchorage devices according to requirements in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
  - 2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches. Certify compliance with test parameters.
  - 3. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.6 for molded-case circuit breakers. Test all NEMA AB1, molded case circuit breakers with thermal magnetic trip or auxiliary, solid-state trip units 100A and larger. Certify compliance with test parameters.
    - a. Visual and Mechanical Inspection
      - 1) Circuit breaker shall be checked for proper mounting and compare nameplate data to Drawings and Specifications.
      - 2) Operate circuit breaker to ensure smooth operation.
      - 3) Inspect case for cracks or other defects.
      - 4) Check internals on unsealed units.
    - b. Electrical Tests
      - 1) Perform a contact resistance test.
      - 2) Perform an insulation resistance test at 1000 volts dc from pole-to-pole and from each pole-to-ground with breaker closed and across open contacts of each phase.
      - 3) Perform long time delay time-current characteristic tests by passing three hundred percent (300%) rated current through each pole separately. Record trip time. Make external adjustments as required to meet time current curves.
      - 4) Determine short time pickup and delay by primary current injection.
      - 5) Determine ground fault pickup and time delay by primary current injection.
      - 6) Determine instantaneous pickup current by primary injection using run-up or pulse method.
      - 7) Perform adjustments for final settings in accordance with coordination study.
      - 8) For circuit breakers 800A and larger, verify all functions of trip unit by means of secondary injection in lieu of primary injection.
    - c. Test Values
      - 1) Compare contact resistance or millivolt drop values to adjacent poles and similar breakers. Investigate deviations of more than fifty percent (50%). Investigate any value exceeding manufacturer's recommendations.
      - 2) Insulation resistance shall not be less than 100 megohms.
      - 3) Trip characteristic of breakers shall fall within manufacturer's published time-current characteristic tolerance band, including adjustment factors.

- 4) All trip times shall fall within N.E.T.A. Acceptance Testing Specifications, Table 10.7 Circuit breakers exceeding specified trip time at three hundred percent (300%) of pickup shall be tagged defective.
  - 5) Instantaneous pickup values shall be within values shown on N.E.T.A. Acceptance Testing Specifications, Table 10.8 or manufacturer's recommendations.
4. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

**3.06 ADJUSTING**

- A. Set field-adjustable switches and circuit-breaker trip and time delay settings to values as determined by the protective device coordination study.

**3.07 CLEANING**

- A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.
- B. Inspect exposed surfaces and repair damaged finishes.

**END OF SECTION 26 2816**

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## SECTION 26 5119 - LED INTERIOR LIGHTING

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### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. Section Includes:
  - 1. Interior solid-state luminaires that use LED technology.
  - 2. Lighting fixture supports.
- B. Related Requirements:
  - 1. Division 26 "Lighting Control Devices."

#### 1.03 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. Lamp: LED and substrate as a replaceable assembly.
- F. LED: Light-emitting diode.

- G. Lumen: Measured output of lamp and luminaire, or both.
- H. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

#### **1.04 SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Arrange in order of luminaire designation.
  - 2. Include data on features, accessories, and finishes.
  - 3. Include physical description and dimensions of luminaires.
  - 4. Include emergency lighting units, including batteries and chargers.
  - 5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
  - 6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project per IES LM-79 and IES LM-80.
    - a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products or certified by a qualified independent testing agency.
- B. Shop Drawings: For nonstandard or custom luminaires.
  - 1. Include plans, elevations, sections, and mounting and attachment details.
  - 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include diagrams for power, signal, and control wiring.
- C. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Lighting luminaires.
  - 2. Suspended ceiling components.
  - 3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
  - 4. Structural members to which equipment and or luminaires will be attached.
  - 5. Initial access modules for acoustical tile, including size and locations.
  - 6. Items penetrating finished ceiling, including the following:
    - a. Other luminaires.
    - b. Air outlets and inlets.
    - c. Speakers.
    - d. Sprinklers.
    - e. Access panels.
    - f. Ceiling-mounted projectors.
    - g. Moldings.
- D. Qualification Data: For testing laboratory providing photometric data for luminaires.
- E. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- F. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.
- G. Sample warranty.

#### **1.05 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
  - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.



**1.06 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. LED Boards: 5% attic stock of each type and rating installed. Furnish at least one of each type.
  - 2. LED Drivers 5% attic stock of each type and rating installed. Furnish at least one of each type.
  - 3. Diffusers and Lenses: 1% attic stock of each type and rating installed. Furnish at least one of each type.
  - 4. Globes and Guards: 5% attic stock of each type and rating installed. Furnish at least one of each type.

**1.07 QUALITY ASSURANCE**

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
- B. Provide luminaires from a single manufacturer for each luminaire type.
- C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Comply with:
  - 1. NFPA 70 - National Electrical Code.
  - 2. NECA/IESNA 500-1998 – Recommended Practice for Installing Indoor Commercial Lighting Systems.
  - 3. NECA/IESNA 502-1999 – Recommended Practice for Installing Industrial Lighting Systems.
  - 4. Code of Federal Regulations (47 CFR 37342).
- F. FMG Compliance: Fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.
- G. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

**1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

**1.09 COORDINATION**

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

**1.10 WARRANTY**

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) or manufacturer's standard warranty length (whichever is longer) from date of Substantial Completion.

**PART 2 PRODUCTS**

**2.01 LUMINAIRES (LIGHTING FIXTURES)**

- A. Provide Luminaires as included in specification 26 5700 "Luminaire Product Data." This section contains product data sheets from the basis of design manufacturer with annotations.
- B. Acceptable alternate manufacturers are indicated on the product data sheets. Alternate manufacturer products shall be equal in all respects including materials, finishes, photometric

performance and energy performance and shall include all options, features, and accessories identified.

- C. The Luminaire schedule shown on the drawings is supplemental provided for convenience and reference only. The requirements of this section and 26 5700 shall govern.

## **2.02 LUMINAIRE REQUIREMENTS**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. Unless otherwise specified in Luminaire product data, provide products with a minimum CRI as noted.
- E. Unless otherwise specified in Luminaire product data, provide products with a CCT as noted.
- F. Unless otherwise specified in Luminaire product data, provide products with an IES LM-80 rated lamp life of 50,000 hours.
- G. Driver
  - 1. Provided as an integrated component of the luminaire or as an external component of an assembly of luminaries.
  - 2. Nominal Input Voltage: All drivers shall be rated for use on either 120V or 277V systems.

## **2.03 EXIT SIGNS**

- A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
  - 1. Lamps: Light-emitting diodes, 70,000 hours minimum of rated lamp life.
- C. Provide edge lit signs with a mirror plaque background.

## **2.04 EMERGENCY LIGHTING UNITS**

- A. General: Self-contained units complying with UL 924.
  - 1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life and special warranty.
  - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
  - 3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
  - 4. Wire Guard: Where indicated, heavy-chrome-plated wire guard protects lamp heads or fixtures.

## **2.05 EMERGENCY AUTOMATIC LOAD CONTROL RELAY**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Bodine BLCD Series.
  - 2. Nine-24, Inc.: ELCR Series.
  - 3. LVS, EPC Series
  - 4. IOTA, ETS-20 Series
  - 5. Functional Devices, Inc., ESR Series
  - 6. ETC, ALCR Series
  - 7. Wattstopper, ELCU series
- B. Description:

1. The Automatic Load Control Relay (ALCR) shall provide required functionality to allow any standard lighting control device to control emergency lighting in conjunction with normal lighting in any area of the building.
  2. The ALCR shall allow control of emergency lighting fixtures in tandem with normal lighting in an area while ensuring that emergency lighting will turn on immediately to full brightness upon loss of normal power supplying the control device.
  3. Emergency lighting operation shall be independent for each controlled area and shall not require a generalized power failure for proper operation.
  4. Self-contained with integral ½" nipple mount with snap in locking feature for mounting into a standard junction box knock out.
  5. Normally closed dry contacts capable of switching 20 amp emergency ballast loads @ 120-277 VAC, 60 Hz, or 10 amp tungsten loads @ 120 VAC, 60 Hz.
  6. Universal rated voltage inputs provided for normal power sense and normal switched power at 120-277 VAC, 60 Hz.
  7. Integral momentary test switch. Pressing and holding this switch shall instantly force the unit into emergency mode and turn on emergency lighting. Releasing the test switch shall immediately return the unit to normal operation.
  8. Dedicated leads and 24 VDC source for connection to remote test switch, fire alarm system, or other external system capable of providing a normally closed dry contact closure. Breaking contact between the terminals shall force and hold the emergency lighting on until the terminals are again closed. An integral LED indicator shall indicate the unit's current remote activation status.
  9. Separate LEDs to indicate the presence of normal and emergency power sources. The LEDs shall indicate the unit's current operational mode (normal or emergency).
  10. Normal power input leads shall be connected to the line side of the control device such that any upstream fault causing a loss of power, including the tripping of the branch circuit breaker, will force the unit into the emergency mode and turn on the emergency lighting.
  11. Automatically switch emergency lighting on and off as normal lighting is switched. When normal power is not available, the unit shall force and hold emergency lighting on regardless of the state of any external control device until normal power is restored.
  12. Utilize zero crossing circuitry to protect relay contacts from inrush current.
  13. Plenum rated housing equipped with compression flying leads.
  14. The unit shall be UL listed to the UL924 standard and labeled for connection to both normal and emergency lighting power sources.
- C. Provide device with proper rating for total load and load type being transferred
- D. Provide for devices suitable for line voltage and low voltage dimming control where required such that device bypasses dimming control signal to luminaire to provide full output upon loss of normal power.
- E. Coordinate with luminaire product data, lighting control schedules and details and diagrams included on the drawings for dimming characteristics.

## **2.06 BRANCH CIRCUIT EMERGENCY LIGHTING TRANSFER SWITCH**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. LVS EPC-D-F-ATS Series
  2. Bodine.
- B. Description: Localized load transfer switch to allow emergency fixture to be powered and controlled by the normal lighting circuit, sense presence of normal power ahead of control circuit and switch luminaire (both line and neutral) over to emergency source upon loss of normal source.
- C. Universal dimming capability to allow the lighting to be controlled and dimmed by the normal lighting circuit during normal times. In the event of a loss of the normal branch circuit, and transfer the designated emergency fixtures from normal dimming control to the emergency power source and bring them to full brightness, regardless of the current state of the dimming system.

- D. Device shall be mounted remotely for each control circuit as application requires.
- E. Listed and labeled by an NRTL to the UL1008 for emergency operation and listed for field installation.
- F. Integral test switch and indicating lamps to indicate status.
- G. Provide device with proper rating for total load and load type being transferred
- H. Coordinate with luminaire product data, lighting control schedules and details and diagrams included on the drawings.

## **2.07 MATERIALS**

- A. Metal Parts:
  - 1. Free of burrs and sharp corners and edges.
  - 2. Sheet metal components shall be steel unless otherwise indicated.
  - 3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers and Globes:
  - 1. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
  - 2. Glass: Annealed crystal glass unless otherwise indicated.
  - 3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- D. Factory-Applied Labels: Comply with UL 1598 Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
  - 1. Label shall include the following lamp characteristics:
    - a. "USE ONLY" and include specific lamp type.
    - b. Lamp diameter, shape, size, wattage, and coating.
    - c. CCT and CRI for all luminaires.

## **2.08 METAL FINISHES**

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

## **2.09 LUMINAIRE FIXTURE SUPPORT COMPONENTS**

- A. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: Unless otherwise specified in Luminaire product data, provide products with a minimum 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: Unless otherwise specified in Luminaire product data, provide products with a minimum ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.
- D. Rod Hangers: Unless otherwise specified in Luminaire product data, provide products with a minimum 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.02 TEMPORARY LIGHTING**

- A. Do not use permanent luminaires for temporary lighting.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions and N.E.C.A./I.E.S.N.A. 500-2006 and 502-2006.
- B. Locate ceiling luminaires as indicated on reflected ceiling plan.
- C. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.
  - 1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from fixture corners.
  - 2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
  - 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
- D. Support luminaires independent of ceiling framing. Support recessed grid luminaires from two opposite corners directly to structure. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- E. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure.
- F. Install recessed luminaires to permit removal from below.
- G. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- H. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- I. Install fixture with no gaps between adjacent fixtures or between fixtures and surrounding surfaces. Trims of fixtures shall be properly and uniformly aligned.
- J. Supports:
  - 1. Sized and rated for luminaire weight.
  - 2. Able to maintain luminaire position after cleaning.
  - 3. Provide support for luminaire without causing deflection of ceiling or wall.
  - 4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- K. Flush-Mounted Luminaire Support:
  - 1. Secured to outlet box.
  - 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
  - 3. Trim ring flush with finished surface.
- L. Wall-Mounted Luminaire Support:
  - 1. Attached to structural members in walls.
  - 2. Do not attach luminaires directly to gypsum board.
- M. Ceiling-Mounted Luminaire Support:
  - 1. As noted.
- N. Suspended Luminaire Support:
  - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
  - 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
  - 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing, rod, or wire support for suspension for each unit length of luminaire chassis, including one at each end.
  - 4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

- O. Comply with requirements in Section 26 0519 "Conductors and Cables" for wiring connections.
- P. Fixtures shall have their exterior labels removed and shall be thoroughly cleaned.
- Q. Locate the remote test/monitor modules identically so that they are visible and they form a straight line when viewed from the end of the corridor or room. Where a suspended ceiling exists, center the modules in adjacent ceiling tiles.

### **3.04 CONNECTIONS**

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- B. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- C. Bond products and metal accessories to branch circuit equipment grounding conductor.
- D. Connect luminaires to branch circuit outlet boxes provided under Division 26 Section "Raceways and Boxes" using 1/2" flexible conduit.

### **3.05 IDENTIFICATION**

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

### **3.06 FIELD QUALITY CONTROL**

- A. Perform the following tests and inspections:
  - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
  - 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.
- D. A visual inspection shall be performed to verify cleanliness and alignment of the fixtures, misalignment and light leaks shall be corrected, and rattles due to ventilation system vibration shall be eliminated.

### **3.07 STARTUP SERVICE**

- A. Comply with requirements for startup specified in Section 26 0943.23 "Relay-Based Lighting Controls."

### **3.08 ADJUSTING**

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
  - 1. During adjustment visits, inspect all luminaires. Replace lamps, drivers, or luminaires that are defective.
  - 2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
  - 3. Adjust the aim of luminaires in the presence of the Architect.
- B. Adjust exit sign directional arrows as indicated on Drawings.
- C. Adjust and calibrate all dimming system controls until the system works as designed. Contact the Architect/Engineer when dimming is complete and demonstrate operation to owner's representative and Architect/Engineer.

**3.09      CLEANING**

- A.    Clean electrical parts to remove conductive and deleterious materials.
- B.    Remove dirt and debris from enclosures and lenses.
- C.    Clean photometric control surfaces as recommended by manufacturer.
- D.    Clean finishes and touch up damage.

**END OF SECTION 26 5119**

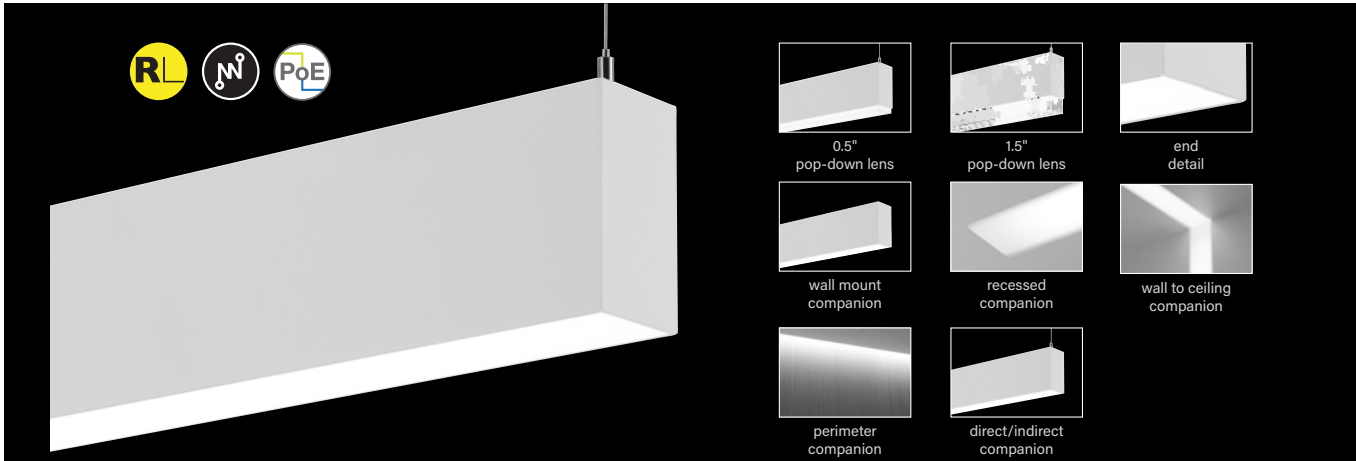
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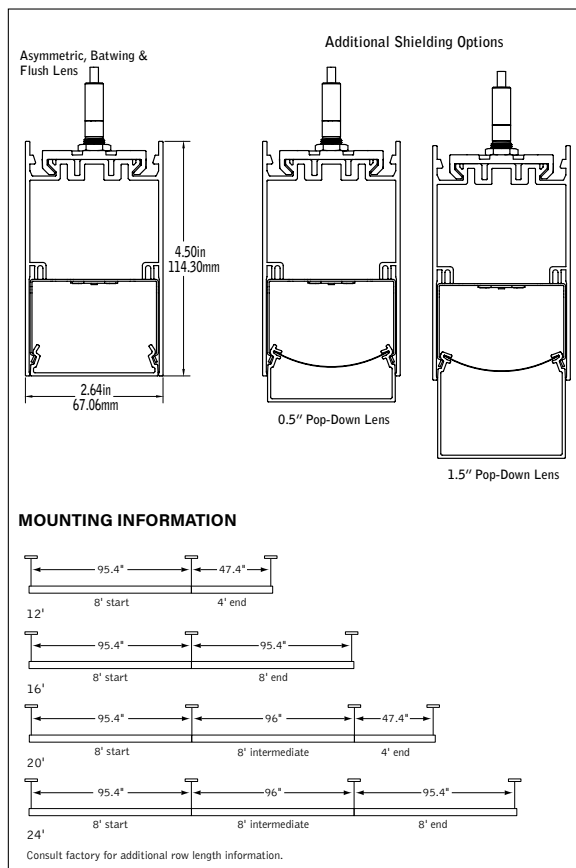
# Seem® 2

LED

TYPE L1A  
ALTERNATE MANUFACTURERS:  
PRUDENTIAL "BIONICPRO2" SERIES  
FORUM "ALUMINA" SERIES  
LUXILLUMINAIRE "EOS 2.0" SERIES



## DIMENSIONAL DATA



## FEATURES

Narrow 2.5" linear direct LED with Asymmetric, Batwing, Flush, 0.5" or 1.5" Pop-Down lens.

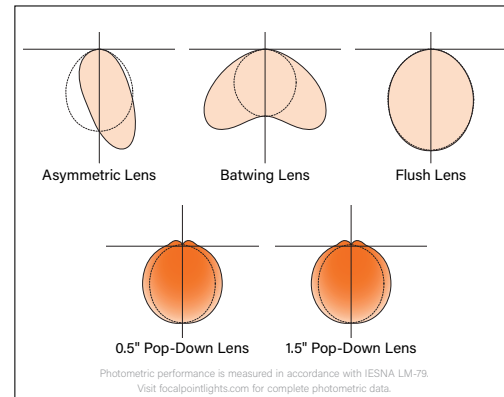
Frosted acrylic lens provides uninterrupted illumination, without pixels or shadows.

Individual units and continuous runs in 1' increments.

Connected Solutions: Integrates with wired and wireless building lighting control systems.

PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires.

## DISTRIBUTIONS



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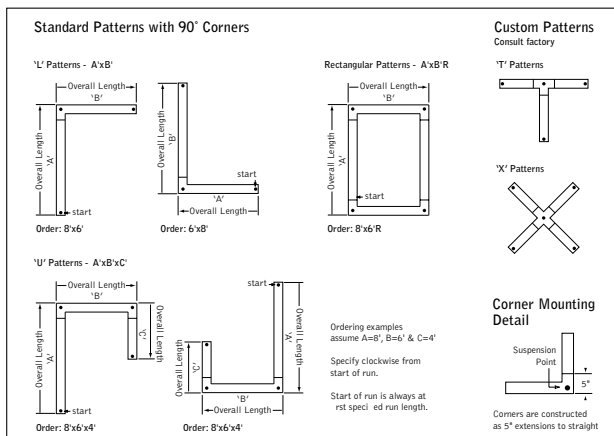
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December 2022 AK

fixture:

project:

## MOUNTING INFORMATION



## SPECIFICATIONS

## LED System

Proprietary linear LED module incorporates premium LEDs on a robust platform to achieve excellent thermal management. LEDs are placed to promote a uniform appearance. Available in 2700K, 3000K, 3500K or 4000K with CRI>80 or CRI>90, 3 SDCM. 3500K and 4000K with CRI>90 have a cyanosis observation index (COI) of 3.3 or less. LED modules and drivers are replaceable from below.

## Construction

One piece extruded aluminum housing. Cast aluminum end caps. 8' unit weight: 30 lbs.

## Optic

Reflectors fabricated of 22 Ga. steel finished in matte white powder coat. Extruded acrylic lens with satin finish, up to 8' continuous.

## Electrical

Luminaires are pre-wired with factory installed branch circuit wiring and over-molded quick connects. Standard 120-277V constant current driver includes 0-10V analog dimming. Power factor > .9. PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires. PoE runs require an independent PoE node and power feed for each luminaire section.

## Emergency

Emergency Battery output - 10 watts for 90 minutes. Maximum mounting height: 20 ft. Emergency Circuit with Connected Solutions (DLM1, LMFS1, LMFS1, NL1, ENL1, CLM1, NXE1, WLXP) shipped standard with leads to connect UL924 compliant device, by others.

## Labels

UL and cUL listed. Suitable for Dry or Damp Locations, indoor use only.

## Finish

Polyester powder coat applied over a multi-stage pre-treatment. Canopy and cord white as standard.

## Lumen Maintenance

Reported: L70 at >61,000 hours      Calculated: L70 at 385,000 hours  
L90 at >61,000 hours      L90 at 103,000 hours

Derived from EPA TM-21 calculator. Based on typical conditions, consult factory for additional data.

## Reliability

At Focal Point, our products are designed to stand the test of time. Each luminaire is engineered using superior components, manufactured with the utmost care and rigorously tested. Contact us for reliability data.

## Warranty

LED system rated for operation in ambient environments up to 25°C. 5-year limited warranty.

## 4' PERFORMANCE CHART

See page 3.



Options in orange qualify for the Quickship program. 1000' total.  
Refer to Quickship Guide for complete details including EM/EC options.

Focal Point LLC reserves the right to change specifications for product improvement without notification.

TYPE L1A

## ORDERING

## Luminaire Series

## FSM2LS

Seem 2 LED

FSM2LS

## Shielding

Asymmetric Lens

AS

Batwing Lens

BW

Flush Satin Lens

FL

0.5" Pop-Down Lens

PD05

1.5" Pop-Down Lens

PD15

(Individual units only)

## Lumen Output

125 Lumens per foot

125LF

250 Lumens per foot

250LF

375 Lumens per foot

375LF

500 Lumens per foot

500LF

625 Lumens per foot

625LF

750 Lumens per foot

750LF

875 Lumens per foot

875LF

1000 Lumens per foot

1000LF

## Color Temperature

2700K, 80+ CRI or 90+ CRI

27K or 927K

3000K, 80+ CRI or 90+ CRI

30K or 930K

3500K, 80+ CRI or 90+ CRI

35K or 935K

4000K, 80+ CRI or 90+ CRI

40K or 940K

## Circuits &amp; Zones

1 Circuit, non-emergency

1C

Consult Ordering Guide on page 5 for multiple

circuiting and zoning options

C\_Z\_DL

## Voltage

120/277 UNV Volt

UNV

347V

347

(LD1 &amp; L11 only)

Low voltage

LV

## Control System &amp; Dimming Level

0-10V - 10% Dimming

LD1

0-10V - 1% Dimming

L11

Low Voltage, PoE compatible

LVN

(No driver. Not available with EMI or EC LV Voltage only)

Lutron Hi-Lume EcoSystem (LDE1) -

LH1

1% Dimming

D11

DALI 1% Dimming

DLM1

(For 750LF, 875LF &amp; 1000LF consult factory)

Wattstopper DLM - 1% Dimming

LMFS1

Wattstopper Fixture Sensor

LMFS1

Low Density - 1% Dimming

LMFS1

Wattstopper Fixture Sensor

LMFS1

High Density - 1% Dimming

LMFS1

(See sensor layout guide)

Acuity nLight - 1% Dimming

NL1

Enlighted Smart Sensor - 1% Dimming

ENL1

(See sensor layout guide)

Enceelium CLM Connected Lighting Module -

CLM1

1% Dimming

NXE1

Current NX Enabled - 1% Dimming

WLXP

WaveLinX Pro - 1% Dimming

WLXP

(See sensor layout guide)

24" Cable Suspension

C24

48" Cable Suspension

C48

96" Cable Suspension

C96

(Specify canopy color White (WH), Black (BK) or Titanium Silver (TS))

(Specify one of the following in place of "C"

J - for 2" canopies at non-feed locations; CS - for sloped ceiling applications)

## Surface Mount

SM

(Not available with CLM1, DLM1, NL1 or NXE1)

## Factory Options

(See Ordering Guide on page 5 for ordering details for factory options)

Black Cord

BKCD

Daylight Circuit

DC

Emergency Battery Pack

EM

Emergency Control Device

ECD

(3' minimum, 120/277 Volt only)

## Finish

Black

BK

Titanium Silver

TS

Matte White Housing

WH

## Luminaire Length

X'

1' row length in 1' increments

X'

(2' minimum. Leave blank for patterns.

Smaller increments available, consult factory)

## Pattern Options

(2' minimum length)

'L' pattern

A' x B'

'U' pattern

A' x B' x C'

Rectangular pattern






A' x B' R

(Consult factory for other pattern options)

FOR EMERGENCY  
FIXTURES ONLYPROVIDE LENGTHS AS  
INDICATED ON PLANS

TYPE L1A

4' PERFORMANCE CHART

Lumen Output	Delivered Lumens	Tested System Watts	Lumens Per Watt (LPW)				
			 AS	 BW	 FL	 PD05	 PD15
125LF	500	6	95	91	88	81	82
250LF	1000	10	113	108	103	94	98
375LF	1500	14	120	116	105	101	100
500LF	2000	19	123	118	107	103	102
625LF	2500	24	121	116	105	101	101
750LF	3000	28	122	117	108	101	100
875LF	3500	34	120	115	104	100	100
1000LF	4000	39	119	114	105	101	100

Based on 3500K, 4' length, Lumen multipliers:  
Delivered lumens may vary +/- 5%. Actual wattage may vary +/- 5%.

# Ordering Guide

Direct Only Linear Circuitry, Zones & Factory Options



## HOW TO USE THIS GUIDE

Fill out the worksheet on the following page to specify your requirements for circuitry, zones, and factory options.

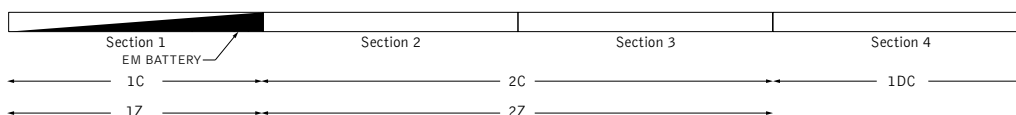
Refer to the run chart for standard run configurations, consult factory for custom configurations.

Complete the Totals / Ordering Codes at the bottom of the worksheet and add to your ordering logic on the cut sheet.

Submit the worksheet along with your order.

EXAMPLE	TOTAL RUN LENGTH: 32ft		JOB NAME:			FIXTURE TYPE:			
	HOUSING SECTION	SECTION LENGTH	SHARED ELECTRICAL FEED, NORMAL POWER			FACTORY OPTIONS			
						SEPARATE ELECTRICAL FEEDS			EM
			SWITCHING CIRCUIT	DIMMING ZONE	DAYLIGHT ZONE	DAYLIGHT CIRCUIT	EMERGENCY CIRCUIT	ECD	
	1	8	1C	1Z					1EM
	2	8	2C	2Z					
	3	8	2C	2Z					
	4	8				1DC			
	Totals / Ordering Codes		2C	2Z		1DC			1EM

ORDERING: FSM4L-FL-625LF-35K- 2C2Z -UNV-LD1-G2- 1DC-1EM -WH-32ft



KEY	
<b>C = Switching Circuit</b> Switched Hot / Shared Neutral	<b>DC = Daylight Circuit</b> Switched Hot / Separate Neutral
<b>Z = Dimming Zone</b> Dimming Control Wires	<b>EC = Emergency Circuit</b> Switched Hot / Separate Neutral
<b>DL = Daylight Zone</b> Daylight Dimming Control Wires	<b>EM = Emergency Battery</b> Unswitched Hot / Shared Neutral
	<b>ECD = Emergency Control Device</b> Unswitched Hot / Separate Neutral

## DEFAULTS

- Zones and Factory Options illuminate entire sections from 4' to 8' in length.
- One shared or isolated circuit and zone required per housing section.
- Limit of one EM or ECD per housing section.
- Additional electrical feed required for applications greater than three shared circuits and zones.
- Each DC, EC and ECD require an additional electrical feed.
- ECD not available in the same housing section as EC.
- Longer lead times and additional pricing may apply for custom run configurations.

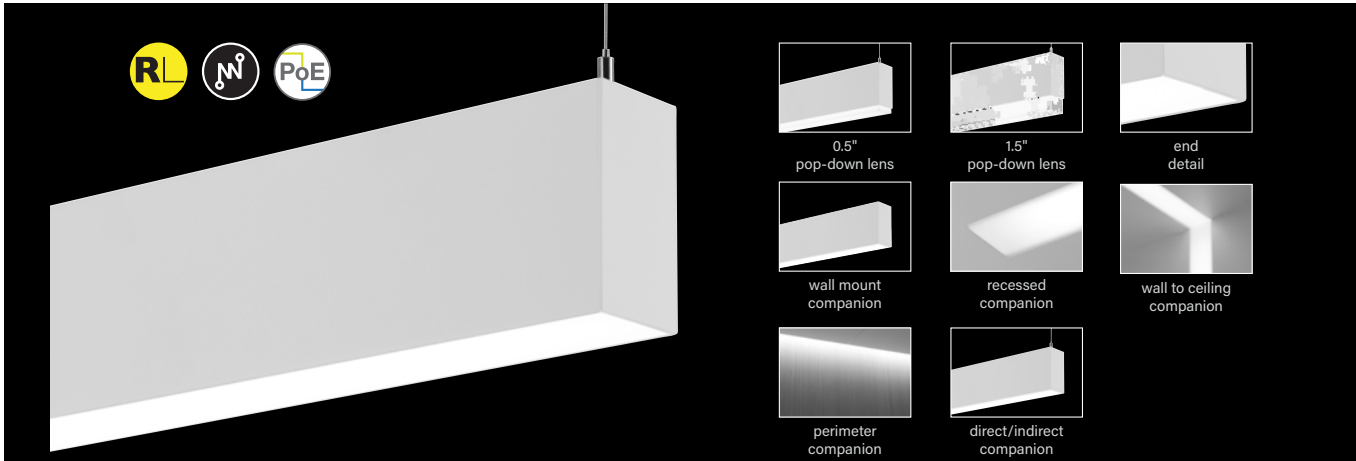
## CUSTOM LENGTHS

- If partial illumination of emergency or daylight section is required, indicate in ordering guide and add "partial illumination" in Order Notes. Drawing required.
- Engineering validation required, longer lead times may apply.

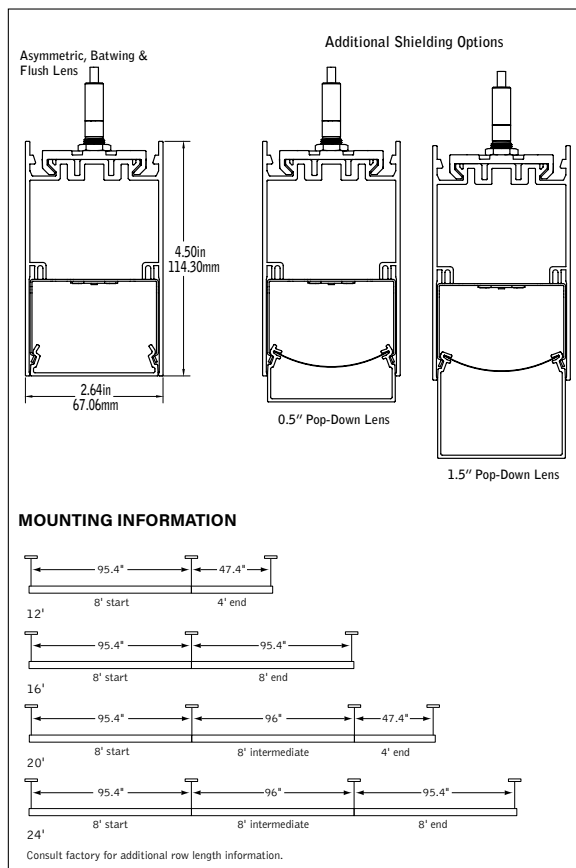
# Seem® 2

LED

TYPE L1B  
ALTERNATE MANUFACTURERS:  
PRUDENTIAL "BIONICPRO2" SERIES  
FORUM "ALUMINA" SERIES  
LUXILLUMINAIRE "EOS 2.0" SERIES



## DIMENSIONAL DATA



## FEATURES

Narrow 2.5" linear direct LED with Asymmetric, Batwing, Flush, 0.5" or 1.5" Pop-Down lens.

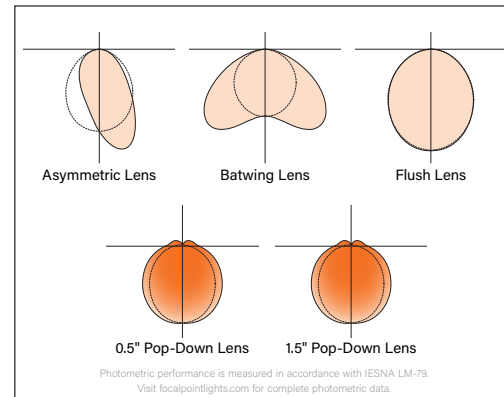
Frosted acrylic lens provides uninterrupted illumination, without pixels or shadows.

Individual units and continuous runs in 1' increments.

Connected Solutions: Integrates with wired and wireless building lighting control systems.

PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires.

## DISTRIBUTIONS



A brand of **legrand**

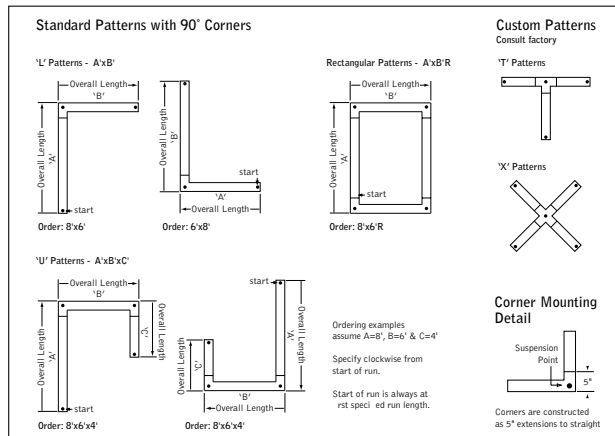
Focal Point LLC | 4141 S. Pulaski Rd, Chicago, IL 60632 | 773.2479494 | focalpointlights.com

December 2022 AK

fixture:

project:

## MOUNTING INFORMATION



## SPECIFICATIONS

## LED System

Proprietary linear LED module incorporates premium LEDs on a robust platform to achieve excellent thermal management. LEDs are placed to promote a uniform appearance. Available in 2700K, 3000K, 3500K or 4000K with CRI>80 or CRI>90, 3 SDCM. 3500K and 4000K with CRI>90 have a cyanosis observation index (COI) of 3.3 or less. LED modules and drivers are replaceable from below.

## Construction

One piece extruded aluminum housing. Cast aluminum end caps. 8' unit weight: 30 lbs.

## Optic

Reflectors fabricated of 22 Ga. steel finished in matte white powder coat. Extruded acrylic lens with satin finish, up to 8' continuous.

## Electrical

Luminaires are pre-wired with factory installed branch circuit wiring and over-molded quick connects. Standard 120-277V constant current driver includes 0-10V analog dimming. Power factor > .9. PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires. PoE runs require an independent PoE node and power feed for each luminaire section.

## Emergency

Emergency Battery output - 10 watts for 90 minutes. Maximum mounting height: 20 ft. Emergency Circuit with Connected Solutions (DLM1, LMFS1, LMFS1, NL1, ENL1, CLM1, NXE1, WLXP) shipped standard with leads to connect UL924 compliant device, by others.

## Labels

UL and cUL listed. Suitable for Dry or Damp Locations, indoor use only.

## Finish

Polyester powder coat applied over a multi-stage pre-treatment. Canopy and cord white as standard.

## Lumen Maintenance

Reported: L70 at >61,000 hours Calculated: L70 at 385,000 hours  
L90 at >61,000 hours L90 at 103,000 hours

Derived from EPA TM-21 calculator. Based on typical conditions, consult factory for additional data.

## Reliability

At Focal Point, our products are designed to stand the test of time. Each luminaire is engineered using superior components, manufactured with the utmost care and rigorously tested. Contact us for reliability data.

## Warranty

LED system rated for operation in ambient environments up to 25°C. 5-year limited warranty.

## 4' PERFORMANCE CHART

See page 3.



Options in orange qualify for the Quickship program. 1000' total.  
Refer to Quickship Guide for complete details including EM/EC options.

Focal Point LLC reserves the right to change specifications for product improvement without notification.

TYPE L1B

## ORDERING

## Luminaire Series

## FSM2LS

Seem 2 LED

FSM2LS

## Shielding

Asymmetric Lens

AS

Batwing Lens

BW

Flush Satin Lens

FL

0.5" Pop-Down Lens

PD05

1.5" Pop-Down Lens

PD15

(Individual units only)

## Lumen Output

125 Lumens per foot

125LF

250 Lumens per foot

250LF

375 Lumens per foot

375LF

500 Lumens per foot

500LF

625 Lumens per foot

625LF

750 Lumens per foot

750LF

875 Lumens per foot

875LF

1000 Lumens per foot

1000LF

## Color Temperature

2700K, 80+ CRI or 90+ CRI

27K or 927K

3000K, 80+ CRI or 90+ CRI

30K or 930K

3500K, 80+ CRI or 90+ CRI

35K or 935K

4000K, 80+ CRI or 90+ CRI

40K or 940K

## Circuits &amp; Zones

1 Circuit, non-emergency

1C

Consult Ordering Guide on page 5 for multiple

circuiting and zoning options

C\_Z\_DL

## Voltage

120/277 UNV Volt

UNV

347V

347

(LD1 &amp; L11 only)

Low voltage

LV

## Control System &amp; Dimming Level

0-10V - 10% Dimming

LD1

0-10V - 1% Dimming

L11

Low Voltage, PoE compatible

LVN

(No driver. Not available with EMI or EC LV Voltage only)

Lutron Hi-Lume EcoSystem (LDE1) -

LH1

1% Dimming

D11

DALI 1% Dimming

DLM1

(For 750LF, 875LF &amp; 1000LF consult factory)

Wattstopper DLM - 1% Dimming

LMFS1

Wattstopper Fixture Sensor<sup>1</sup>

LMFS1

Low Density - 1% Dimming

LMFSD

Wattstopper Fixture Sensor<sup>1</sup>

LMFSD

High Density - 1% Dimming

LMFSD

(See sensor layout guide)

Acuity nLight - 1% Dimming

NL1

Enlighted Smart Sensor - 1% Dimming

ENL1

(See sensor layout guide)

Ecolum CLM Connected Lighting Module -

CLM1

1% Dimming

NXE1

Current NX Enabled - 1% Dimming

WLXP

WaveLinX Pro - 1% Dimming<sup>1</sup>

WLXP

(See sensor layout guide)

24" Cable Suspension

C24

48" Cable Suspension

C48

96" Cable Suspension

C96

(Specify canopy color White (WH), Black (BK) or Titanium Silver (TS))

(Specify one of the following in place of "C"

1 - for 2" canopies at non-feed locations; CS - for sloped ceiling applications)

Surface Mount

SM

(Not available with CLM1, DLM1, NL1 or NXE1)

## Factory Options

(See Ordering Guide on page 5 for ordering details for C24WH, C24BK, C24TS, C48WH, C48BK, C48TS, C96WH, C96BK, C96TS)

Black Cord

BKCD

Daylight Circuit

DC

Emergency Battery

EC

Emergency Battery Pack<sup>1</sup>

EM

Emergency Control Device<sup>1</sup>

ECD

<sup>1</sup>(3' minimum, 120/277 Volt only)

## Finish

Black

BK

Titanium Silver

TS

Matte White Housing

WH

Luminaire Length

X'

1/row length in 1' increments

X'

(2' minimum. Leave blank for patterns.

Smaller increments available, consult factory)

## Pattern Options

(2' minimum length)

'L' pattern

A' x B'

'U' pattern

A' x B' x C'

Rectangular pattern






A' x B' R

(Consult factory for other pattern options)

FOR EMERGENCY  
FIXTURES ONLYPROVIDE LENGTHS AS  
INDICATED ON PLANS

TYPE L1B

4' PERFORMANCE CHART

Lumen Output	Delivered Lumens	Tested System Watts	Lumens Per Watt (LPW)				
			 AS	 BW	 FL	 PD05	 PD15
125LF	500	6	95	91	88	81	82
250LF	1000	10	113	108	103	94	98
375LF	1500	14	120	116	105	101	100
500LF	2000	19	123	118	107	103	102
625LF	2500	24	121	116	105	101	101
750LF	3000	28	122	117	108	101	100
875LF	3500	34	120	115	104	100	100
1000LF	4000	39	119	114	105	101	100

Based on 3500K, 4' length, Lumen multipliers:  
Delivered lumens may vary +/- 5%. Actual wattage may vary +/- 5%

# Ordering Guide

Direct Only Linear Circuitry, Zones & Factory Options



## HOW TO USE THIS GUIDE

Fill out the worksheet on the following page to specify your requirements for circuitry, zones, and factory options.

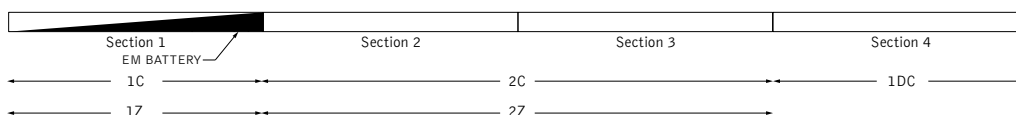
Refer to the run chart for standard run configurations, consult factory for custom configurations.

Complete the Totals / Ordering Codes at the bottom of the worksheet and add to your ordering logic on the cut sheet.

Submit the worksheet along with your order.

EXAMPLE	TOTAL RUN LENGTH: 32ft		JOB NAME:			FIXTURE TYPE:			
	HOUSING SECTION	SECTION LENGTH	SHARED ELECTRICAL FEED, NORMAL POWER			FACTORY OPTIONS			
						SEPARATE ELECTRICAL FEEDS			EM
			SWITCHING CIRCUIT	DIMMING ZONE	DAYLIGHT ZONE	DAYLIGHT CIRCUIT	EMERGENCY CIRCUIT	ECD	
	1	8	1C	1Z					1EM
	2	8	2C	2Z					
	3	8	2C	2Z					
	4	8				1DC			
	Totals / Ordering Codes		2C	2Z		1DC			1EM

ORDERING: FSM4L-FL-625LF-35K- 2C2Z -UNV-LD1-G2- 1DC-1EM -WH-32ft



KEY	
<b>C = Switching Circuit</b> Switched Hot / Shared Neutral	<b>DC = Daylight Circuit</b> Switched Hot / Separate Neutral
<b>Z = Dimming Zone</b> Dimming Control Wires	<b>EC = Emergency Circuit</b> Switched Hot / Separate Neutral
<b>DL = Daylight Zone</b> Daylight Dimming Control Wires	<b>EM = Emergency Battery</b> Unswitched Hot / Shared Neutral
	<b>ECD = Emergency Control Device</b> Unswitched Hot / Separate Neutral

## DEFAULTS

- Zones and Factory Options illuminate entire sections from 4' to 8' in length.
- One shared or isolated circuit and zone required per housing section.
- Limit of one EM or ECD per housing section.
- Additional electrical feed required for applications greater than three shared circuits and zones.
- Each DC, EC and ECD require an additional electrical feed.
- ECD not available in the same housing section as EC.
- Longer lead times and additional pricing may apply for custom run configurations.

## CUSTOM LENGTHS

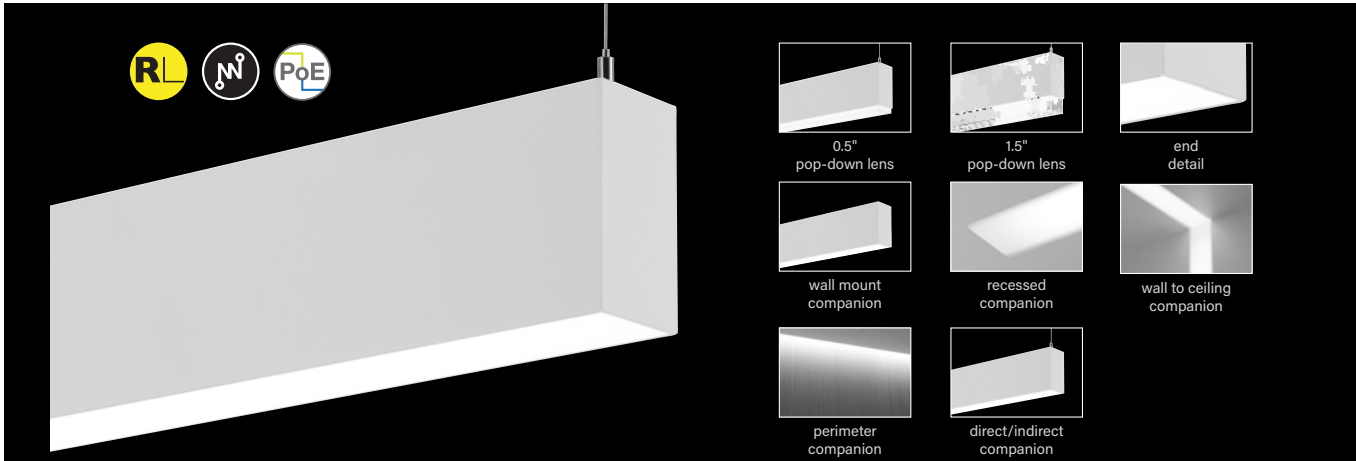
- If partial illumination of emergency or daylight section is required, indicate in ordering guide and add "partial illumination" in Order Notes. Drawing required.
- Engineering validation required, longer lead times may apply.



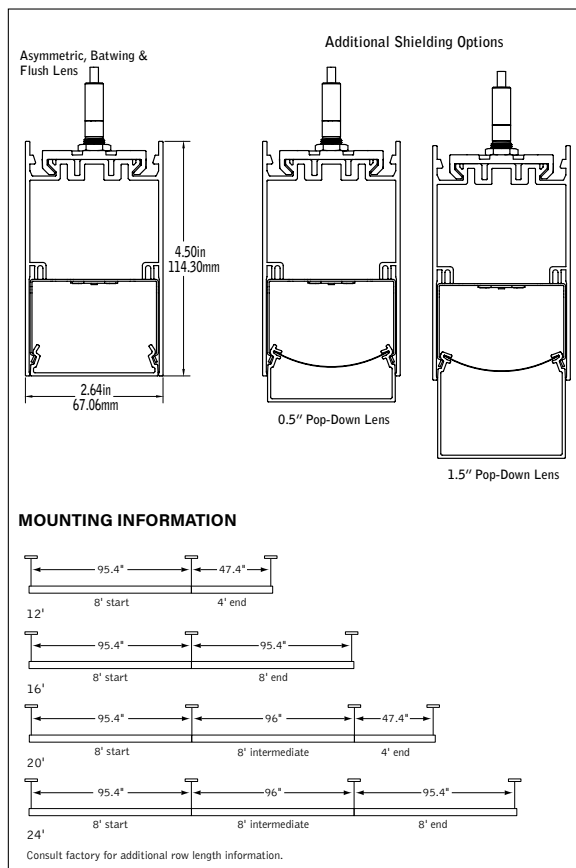
# Seem® 2

LED

TYPE L2A  
ALTERNATE MANUFACTURERS:  
PRUDENTIAL "BIONICPRO2" SERIES  
FORUM "ALUMINA" SERIES  
LUXILLUMINAIRE "EOS 2.0" SERIES



## DIMENSIONAL DATA



## FEATURES

Narrow 2.5" linear direct LED with Asymmetric, Batwing, Flush, 0.5" or 1.5" Pop-Down lens.

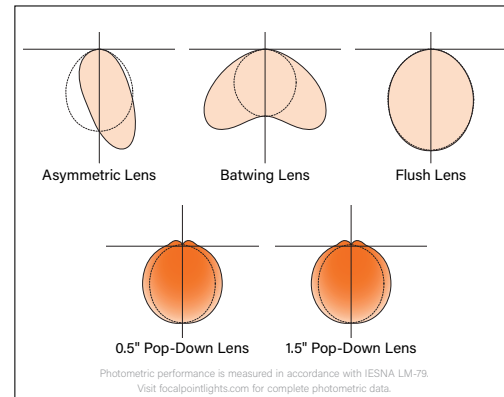
Frosted acrylic lens provides uninterrupted illumination, without pixels or shadows.

Individual units and continuous runs in 1' increments.

Connected Solutions: Integrates with wired and wireless building lighting control systems.

PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires.

## DISTRIBUTIONS



A brand of **legrand**

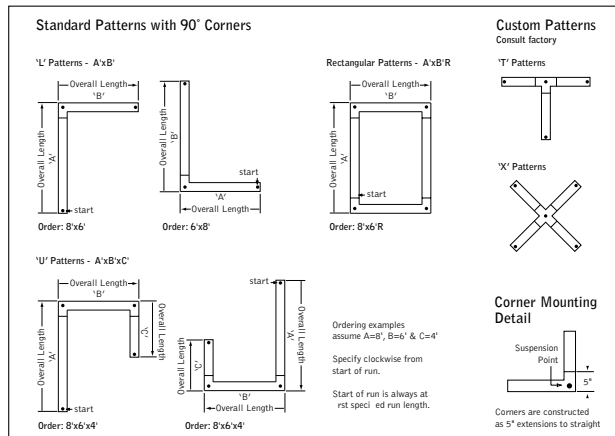
Focal Point LLC | 4141 S. Pulaski Rd, Chicago, IL 60632 | 773.2479494 | focalpointlights.com

December 2022 AK

fixture:

project:

## MOUNTING INFORMATION



## SPECIFICATIONS

## LED System

Proprietary linear LED module incorporates premium LEDs on a robust platform to achieve excellent thermal management. LEDs are placed to promote a uniform appearance. Available in 2700K, 3000K, 3500K or 4000K with CRI>80 or CRI>90, 3 SDCM. 3500K and 4000K with CRI>90 have a cyanosis observation index (COI) of 3.3 or less. LED modules and drivers are replaceable from below.

## Construction

One piece extruded aluminum housing. Cast aluminum end caps. 8' unit weight: 30 lbs.

## Optic

Reflectors fabricated of 22 Ga. steel finished in matte white powder coat. Extruded acrylic lens with satin finish, up to 8' continuous.

## Electrical

Luminaires are pre-wired with factory installed branch circuit wiring and over-molded quick connects. Standard 120-277V constant current driver includes 0-10V analog dimming. Power factor > .9. PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires. PoE runs require an independent PoE node and power feed for each luminaire section.

## Emergency

Emergency Battery output - 10 watts for 90 minutes. Maximum mounting height: 20 ft. Emergency Circuit with Connected Solutions (DLM1, LMFS1, LMFS1, NL1, ENL1, CLM1, NXE1, WLXP) shipped standard with leads to connect UL924 compliant device, by others.

## Labels

UL and cUL listed. Suitable for Dry or Damp Locations, indoor use only.

## Finish

Polyester powder coat applied over a multi-stage pre-treatment. Canopy and cord white as standard.

## Lumen Maintenance

Reported: L70 at >61,000 hours      Calculated: L70 at 385,000 hours  
L90 at >61,000 hours      L90 at 103,000 hours

Derived from EPA TM-21 calculator. Based on typical conditions, consult factory for additional data.

## Reliability

At Focal Point, our products are designed to stand the test of time. Each luminaire is engineered using superior components, manufactured with the utmost care and rigorously tested. Contact us for reliability data.

## Warranty

LED system rated for operation in ambient environments up to 25°C. 5-year limited warranty.

## 4' PERFORMANCE CHART

See page 3.



Options in orange qualify for the Quickship program. 1000' total.  
Refer to Quickship Guide for complete details including EM/EC options.

Focal Point LLC reserves the right to change specifications for product improvement without notification.

TYPE L2A

## ORDERING

## Luminaire Series

## FSM2LS

Seem 2 LED

FSM2LS

## Shielding

Asymmetric Lens

AS

Butting Lens

BW

Flush Satin Lens

FL

0.5" Pop-Down Lens

PD05

1.5" Pop-Down Lens

PD15

(Individual units only)

## Lumen Output

125 Lumens per foot

125LF

250 Lumens per foot

250LF

375 Lumens per foot

375LF

500 Lumens per foot

500LF

625 Lumens per foot

625LF

750 Lumens per foot

750LF

875 Lumens per foot

875LF

1000 Lumens per foot

1000LF

## Color Temperature

2700K, 80+ CRI or 90+ CRI

27K or 927K

3000K, 80+ CRI or 90+ CRI

30K or 930K

3500K, 80+ CRI or 90+ CRI

35K or 935K

4000K, 80+ CRI or 90+ CRI

40K or 940K

## Circuits &amp; Zones

1 Circuit, non-emergency

1C

Consult Ordering Guide on page 5 for multiple

circuiting and zoning options

C\_Z\_DL

## Voltage

120/277 UNV Volt

UNV

347V

347

(LD1 &amp; L11 only)

Low voltage

LV

## Control System &amp; Dimming Level

0-10V - 10% Dimming

LD1

0-10V - 1% Dimming

L11

Low Voltage, PoE compatible

LVN

(No driver. Not available with EMI or EC LV Voltage only)

Lutron Hi-Lume EcoSystem (LDE1) -

LH1

1% Dimming

D11

DALI 1% Dimming

DLM1

(For 750LF, 875LF &amp; 1000LF consult factory)

Wattstopper DLM - 1% Dimming

DLM1

Wattstopper Fixture Sensor

LMFS1

Low Density - 1% Dimming

LMFSD

Wattstopper Fixture Sensor

LMFSD

High Density - 1% Dimming

LMFSD

(See sensor layout guide)

Acuity nLight - 1% Dimming

NL1

Enlighted Smart Sensor - 1% Dimming

ENL1

(See sensor layout guide)

Ecolum CLM Connected Lighting Module -

CLM1

1% Dimming

NXE1

Current NX Enabled - 1% Dimming

WLXP

WaveLinX Pro - 1% Dimming

WLXP

(See sensor layout guide)

24" Cable Suspension

C24

48" Cable Suspension

C48

96" Cable Suspension

C96

(Specify canopy color White (WH), Black (BK) or Silver (SS))

(Specify one of the following in place of "C"

J - for 2" canopies at non-feed locations; CS - for sloped ceiling applications)

Surface Mount

SM

(Not available with CLM1, DLM1, NL1 or NXE1)

## Factory Options

(See Ordering Guide on page 5 for ordering details for factory options)

Black Cord

BKCD

Daylight Circuit

DC

Emergency Battery Pack

EM

Emergency Control Device

ECD

(3' minimum, 120/277 Volt only)

## Finish

Black

BK

Titanium Silver

TS

Matte White Housing

WH

## Luminaire Length

Luminaire Length

X'

(2' minimum. Leave blank for patterns.

Smaller increments available, consult factory)

## Pattern Options

(2' minimum length)

'L' pattern

A' x B'

'U' pattern

A' x B' x C'

Rectangular pattern






A' x B' R

(Consult factory for other pattern options)

FOR EMERGENCY  
FIXTURES ONLYPROVIDE LENGTHS AS  
INDICATED ON PLANS

TYPE L2A

4' PERFORMANCE CHART

Lumen Output	Delivered Lumens	Tested System Watts	Lumens Per Watt (LPW)				
			 AS	 BW	 FL	 PD05	 PD15
125LF	500	6	95	91	88	81	82
250LF	1000	10	113	108	103	94	98
375LF	1500	14	120	116	105	101	100
500LF	2000	19	123	118	107	103	102
625LF	2500	24	121	116	105	101	101
750LF	3000	28	122	117	108	101	100
875LF	3500	34	120	115	104	100	100
1000LF	4000	39	119	114	105	101	100

Based on 3500K, 4' length, Lumen multipliers:  
Delivered lumens may vary +/- 5%. Actual wattage may vary +/- 5%

# Ordering Guide

Direct Only Linear Circuitry, Zones & Factory Options



## HOW TO USE THIS GUIDE

Fill out the worksheet on the following page to specify your requirements for circuitry, zones, and factory options.

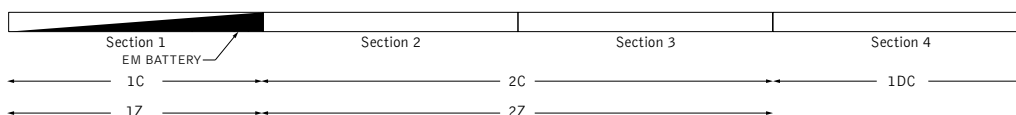
Refer to the run chart for standard run configurations, consult factory for custom configurations.

Complete the Totals / Ordering Codes at the bottom of the worksheet and add to your ordering logic on the cut sheet.

Submit the worksheet along with your order.

EXAMPLE	TOTAL RUN LENGTH: 32ft		JOB NAME:			FIXTURE TYPE:			
	HOUSING SECTION	SECTION LENGTH	SHARED ELECTRICAL FEED, NORMAL POWER			FACTORY OPTIONS			
						SEPARATE ELECTRICAL FEEDS			EM
			SWITCHING CIRCUIT	DIMMING ZONE	DAYLIGHT ZONE	DAYLIGHT CIRCUIT	EMERGENCY CIRCUIT	ECD	
	1	8	1C	1Z					1EM
	2	8	2C	2Z					
	3	8	2C	2Z					
	4	8				1DC			
	Totals / Ordering Codes		2C	2Z		1DC			1EM

ORDERING: FSM4L-FL-625LF-35K- 2C2Z -UNV-LD1-G2- 1DC-1EM -WH-32ft



KEY	
<b>C = Switching Circuit</b> Switched Hot / Shared Neutral	<b>DC = Daylight Circuit</b> Switched Hot / Separate Neutral
<b>Z = Dimming Zone</b> Dimming Control Wires	<b>EC = Emergency Circuit</b> Switched Hot / Separate Neutral
<b>DL = Daylight Zone</b> Daylight Dimming Control Wires	<b>EM = Emergency Battery</b> Unswitched Hot / Shared Neutral
	<b>ECD = Emergency Control Device</b> Unswitched Hot / Separate Neutral

## DEFAULTS

- Zones and Factory Options illuminate entire sections from 4' to 8' in length.
- One shared or isolated circuit and zone required per housing section.
- Limit of one EM or ECD per housing section.
- Additional electrical feed required for applications greater than three shared circuits and zones.
- Each DC, EC and ECD require an additional electrical feed.
- ECD not available in the same housing section as EC.
- Longer lead times and additional pricing may apply for custom run configurations.

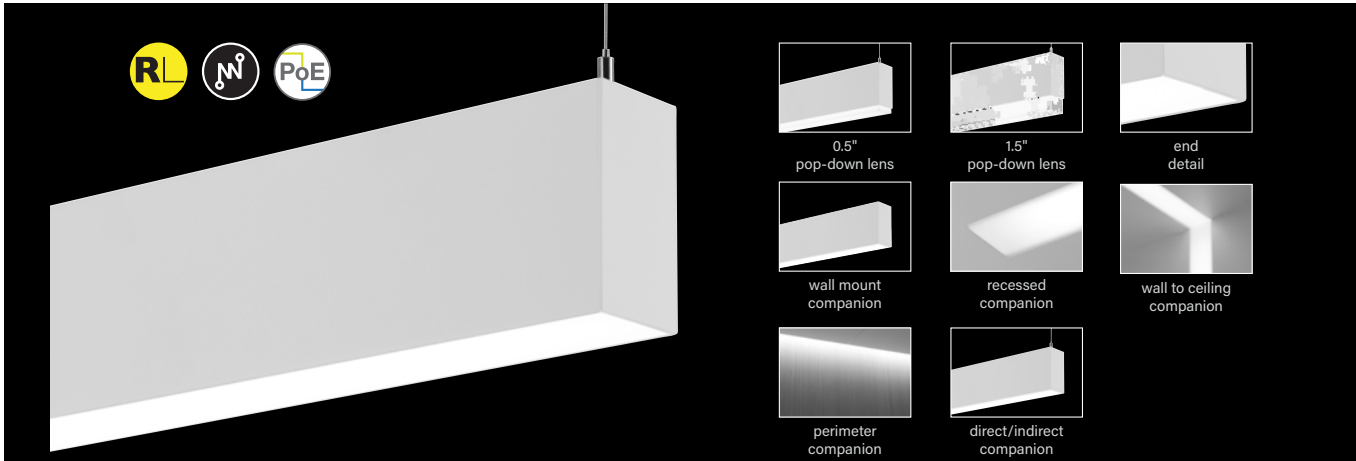
## CUSTOM LENGTHS

- If partial illumination of emergency or daylight section is required, indicate in ordering guide and add "partial illumination" in Order Notes. Drawing required.
- Engineering validation required, longer lead times may apply.

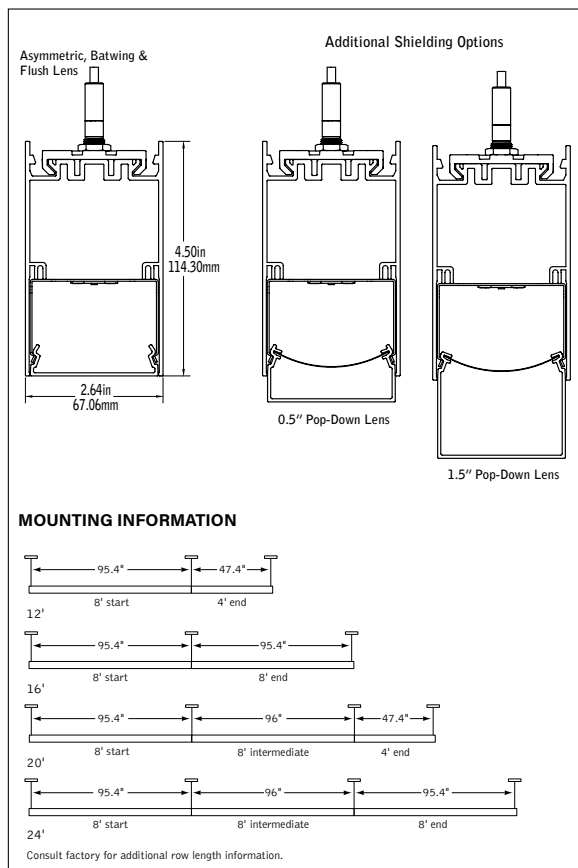
# Seem® 2

LED

TYPE L2B  
ALTERNATE MANUFACTURERS:  
PRUDENTIAL "BIONICPRO2" SERIES  
FORUM "ALUMINA" SERIES  
LUXILLUMINAIRE "EOS 2.0" SERIES



## DIMENSIONAL DATA



## FEATURES

Narrow 2.5" linear direct LED with Asymmetric, Batwing, Flush, 0.5" or 1.5" Pop-Down lens.

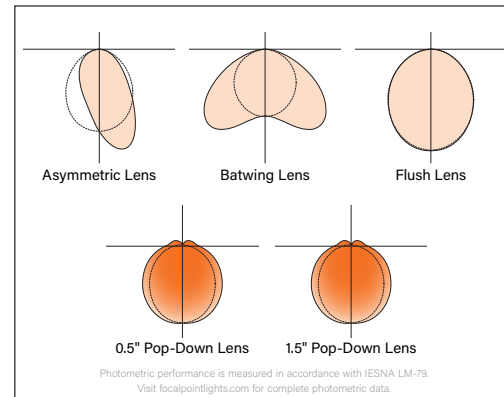
Frosted acrylic lens provides uninterrupted illumination, without pixels or shadows.

Individual units and continuous runs in 1' increments.

Connected Solutions: Integrates with wired and wireless building lighting control systems.

PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires.

## DISTRIBUTIONS



A brand of **legrand**

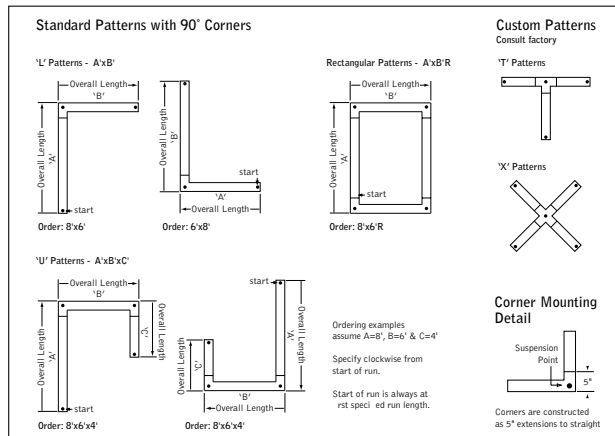
Focal Point LLC | 4141 S. Pulaski Rd, Chicago, IL 60632 | 773.2479494 | [focalpointlights.com](http://focalpointlights.com)

December 2022 AK

fixture:

project:

## MOUNTING INFORMATION



## SPECIFICATIONS

## LED System

Proprietary linear LED module incorporates premium LEDs on a robust platform to achieve excellent thermal management. LEDs are placed to promote a uniform appearance. Available in 2700K, 3000K, 3500K or 4000K with CRI>80 or CRI>90, 3 SDCM. 3500K and 4000K with CRI>90 have a cyanosis observation index (COI) of 3.3 or less. LED modules and drivers are replaceable from below.

## Construction

One piece extruded aluminum housing. Cast aluminum end caps. 8' unit weight: 30 lbs.

## Optic

Reflectors fabricated of 22 Ga. steel finished in matte white powder coat. Extruded acrylic lens with satin finish, up to 8' continuous.

## Electrical

Luminaires are pre-wired with factory installed branch circuit wiring and over-molded quick connects. Standard 120-277V constant current driver includes 0-10V analog dimming. Power factor > .9. PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires. PoE runs require an independent PoE node and power feed for each luminaire section.

## Emergency

Emergency Battery output - 10 watts for 90 minutes. Maximum mounting height: 20 ft. Emergency Circuit with Connected Solutions (DLM1, LMFS1, LMFS1, NL1, ENL1, CLM1, NXE1, WLXP) shipped standard with leads to connect UL924 compliant device, by others.

## Labels

UL and cUL listed. Suitable for Dry or Damp Locations, indoor use only.

## Finish

Polyester powder coat applied over a multi-stage pre-treatment. Canopy and cord white as standard.

## Lumen Maintenance

Reported: L70 at >61,000 hours      Calculated: L70 at 385,000 hours  
L90 at >61,000 hours      L90 at 103,000 hours

Derived from EPA TM-21 calculator. Based on typical conditions, consult factory for additional data.

## Reliability

At Focal Point, our products are designed to stand the test of time. Each luminaire is engineered using superior components, manufactured with the utmost care and rigorously tested. Contact us for reliability data.

## Warranty

LED system rated for operation in ambient environments up to 25°C. 5-year limited warranty.

## 4' PERFORMANCE CHART

See page 3.



Options in orange qualify for the Quickship program. 1000' total.  
Refer to Quickship Guide for complete details including EM/EC options.

Focal Point LLC reserves the right to change specifications for product improvement without notification.

TYPE L2B

## ORDERING

## Luminaire Series

Seem 2 LED

FSM2LS

## Shielding

Asymmetric Lens

AS

Batwing Lens

BW

Flush Satin Lens

FL

0.5" Pop-Down Lens

PD05

1.5" Pop-Down Lens

PD15

(Individual units only)

## Lumen Output

125 Lumens per foot

125LF

250 Lumens per foot

250LF

375 Lumens per foot

375LF

500 Lumens per foot

500LF

625 Lumens per foot

625LF

750 Lumens per foot

750LF

875 Lumens per foot

875LF

1000 Lumens per foot

1000LF

## Color Temperature

2700K, 80+ CRI or 90+ CRI

27K or 927K

3000K, 80+ CRI or 90+ CRI

30K or 930K

3500K, 80+ CRI or 90+ CRI

35K or 935K

4000K, 80+ CRI or 90+ CRI

40K or 940K

## Circuits &amp; Zones

1 Circuit, non-emergency

1C

Consult Ordering Guide on page 5 for multiple

circuiting and zoning options

## Voltage

120/277 UNV Volt

UNV

347V

347

(LD1 &amp; L11 only)

Low voltage

LV

## Control System &amp; Dimming Level

0-10V - 10% Dimming

LD1

0-10V - 1% Dimming

L11

Low Voltage, PoE compatible

LVN

(No driver. Not available with EMI or EC LV Voltage only)

Lutron Hi-Lume EcoSystem (LDE1) -

LH1

1% Dimming

D11

DALI 1% Dimming

DLM1

(For 750LF, 875LF &amp; 1000LF consult factory)

Wattstopper DLM - 1% Dimming

DLM1

Wattstopper Fixture Sensor

LMFS1

Low Density - 1% Dimming

LMFS1

Wattstopper Fixture Sensor

LMFS1

High Density - 1% Dimming

LMFS1

Acuity nLight - 1% Dimming

NL1

Enlighted Smart Sensor - 1% Dimming

ENL1

Enceelium CLM Connected Lighting Module -

CLM1

1% Dimming

NXE1

Current NX Enabled - 1% Dimming

WLXP

WaveLinX Pro - 1% Dimming

WLXP

(3' minimum length, with ECD/EM - 7' minimum)

1 (Not available with pop-down lenses)

## Mounting

24" Cable Suspension

C24

48" Cable Suspension

C48

96" Cable Suspension

C96

(Specify canopy color White (WH), Black (BK) or Titanium Silver (TS))

Example: C24WH

(Specify one of the following in place of "C")

J - for 2" canopies at non-feed locations; CS - for sloped ceiling applications

Surface Mount

SM

(Not available with CLM1, DLM1, NL1 or NXE1)

## Factory Options

(See Ordering Guide on page 5 for ordering details for factory options)

Black Cord

BKCD

Daylight Circuit

DC

Emergency Battery Pack

EM

Emergency Control Device

ECD

(3' minimum, 120/277 Volt only)

## Finish

Black

BK

Titanium Silver

TS

Matte White Housing

WH

## Luminaire Length

Luminaire Length

X'

(2' minimum. Leave blank for patterns.

Smaller increments available, consult factory)

## Pattern Options

(2' minimum length)

'L' pattern

A' x B'

'U' pattern

A' x B' x C'

Rectangular pattern






A' x B' R

(Consult factory for other pattern options)

FOR EMERGENCY  
FIXTURES ONLYPROVIDE LENGTHS AS  
INDICATED ON PLANS

TYPE L2B

4' PERFORMANCE CHART

Lumen Output	Delivered Lumens	Tested System Watts	Lumens Per Watt (LPW)				
			 AS	 BW	 FL	 PD05	 PD15
125LF	500	6	95	91	88	81	82
250LF	1000	10	113	108	103	94	98
375LF	1500	14	120	116	105	101	100
500LF	2000	19	123	118	107	103	102
625LF	2500	24	121	116	105	101	101
750LF	3000	28	122	117	108	101	100
875LF	3500	34	120	115	104	100	100
1000LF	4000	39	119	114	105	101	100

Based on 3500K, 4' length, Lumen multipliers:  
Delivered lumens may vary +/- 5%. Actual wattage may vary +/- 5%.

# Ordering Guide

**Direct Only Linear Circuitry, Zones & Factory Options****HOW TO USE THIS GUIDE**

Fill out the worksheet on the following page to specify your requirements for circuitry, zones, and factory options.

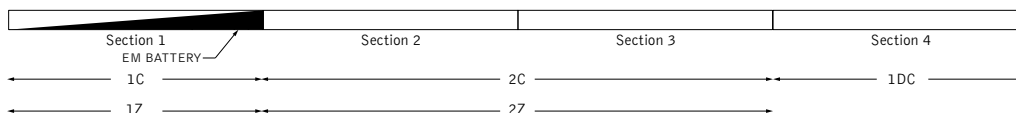
Refer to the run chart for standard run configurations, consult factory for custom configurations.

Complete the Totals / Ordering Codes at the bottom of the worksheet and add to your ordering logic on the cut sheet.

Submit the worksheet along with your order.

EXAMPLE	TOTAL RUN LENGTH: 32ft		JOB NAME:			FIXTURE TYPE:			
	HOUSING SECTION	SECTION LENGTH	SHARED ELECTRICAL FEED, NORMAL POWER			FACTORY OPTIONS			
						SEPARATE ELECTRICAL FEEDS			EM
			SWITCHING CIRCUIT	DIMMING ZONE	DAYLIGHT ZONE	DAYLIGHT CIRCUIT	EMERGENCY CIRCUIT	ECD	
	1	8	1C	1Z				1EM	
	2	8	2C	2Z					
	3	8	2C	2Z					
4	8				1DC				
Totals / Ordering Codes		2C	2Z		1DC			1EM	

ORDERING: FSM4L-FL-625LF-35K- 2C2Z -UNV-LD1-G2- 1DC-1EM -WH-32ft



KEY	
<b>C = Switching Circuit</b> Switched Hot / Shared Neutral	<b>DC = Daylight Circuit</b> Switched Hot / Separate Neutral
<b>Z = Dimming Zone</b> Dimming Control Wires	<b>EC = Emergency Circuit</b> Switched Hot / Separate Neutral
<b>DL = Daylight Zone</b> Daylight Dimming Control Wires	<b>EM = Emergency Battery</b> Unswitched Hot / Shared Neutral
	<b>ECD = Emergency Control Device</b> Unswitched Hot / Separate Neutral

**DEFAULTS**

- Zones and Factory Options illuminate entire sections from 4' to 8' in length.
- One shared or isolated circuit and zone required per housing section.
- Limit of one EM or ECD per housing section.
- Additional electrical feed required for applications greater than three shared circuits and zones.
- Each DC, EC and ECD require an additional electrical feed.
- ECD not available in the same housing section as EC.
- Longer lead times and additional pricing may apply for custom run configurations.

**CUSTOM LENGTHS**

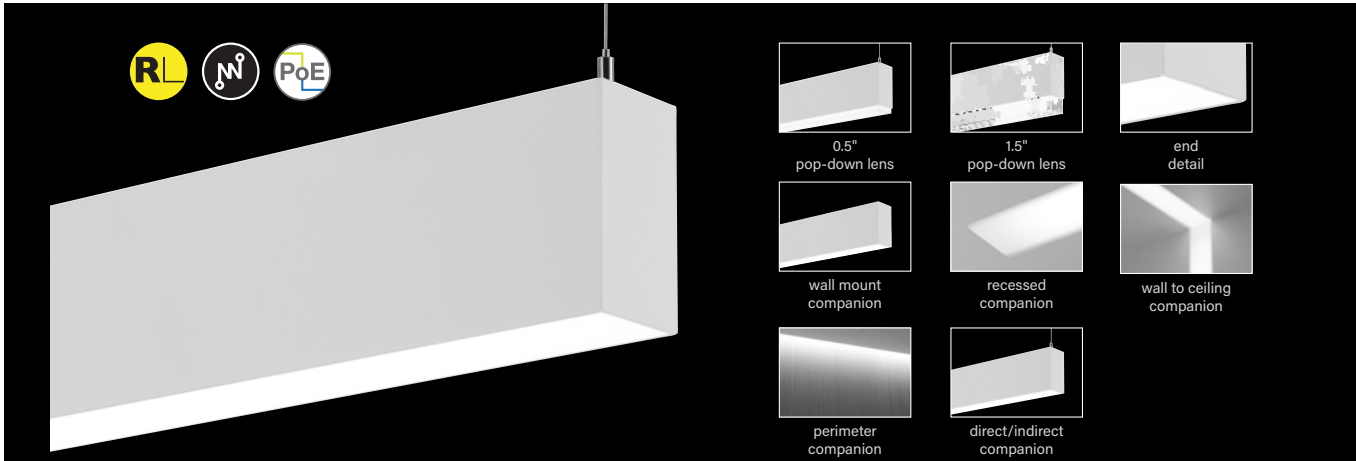
- If partial illumination of emergency or daylight section is required, indicate in ordering guide and add "partial illumination" in Order Notes. Drawing required.
- Engineering validation required, longer lead times may apply.



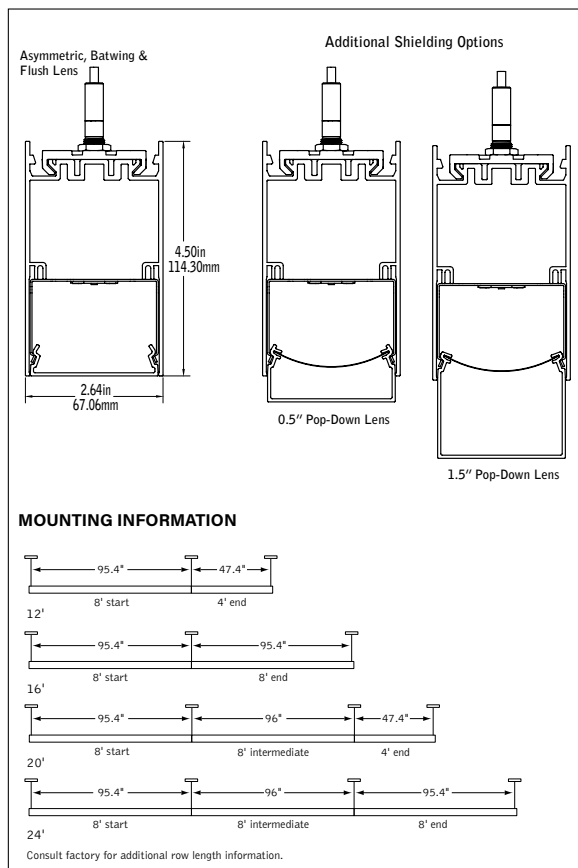
# Seem® 2

LED

TYPE L3  
ALTERNATE MANUFACTURERS:  
PRUDENTIAL "BIONICPRO2" SERIES  
FORUM "ALUMINA" SERIES  
LUXILLUMINAIRE "EOS 2.0" SERIES



## DIMENSIONAL DATA



## FEATURES

Narrow 2.5" linear direct LED with Asymmetric, Batwing, Flush, 0.5" or 1.5" Pop-Down lens.

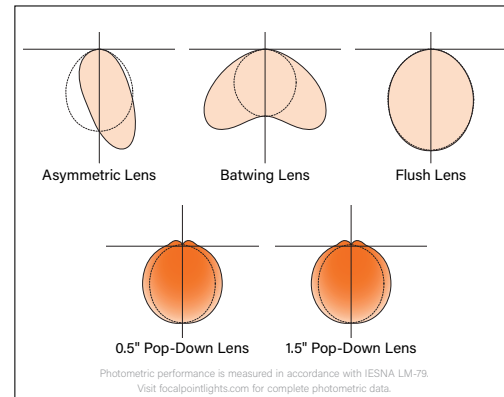
Frosted acrylic lens provides uninterrupted illumination, without pixels or shadows.

Individual units and continuous runs in 1' increments.

Connected Solutions: Integrates with wired and wireless building lighting control systems.

PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires.

## DISTRIBUTIONS



A brand of **legrand**

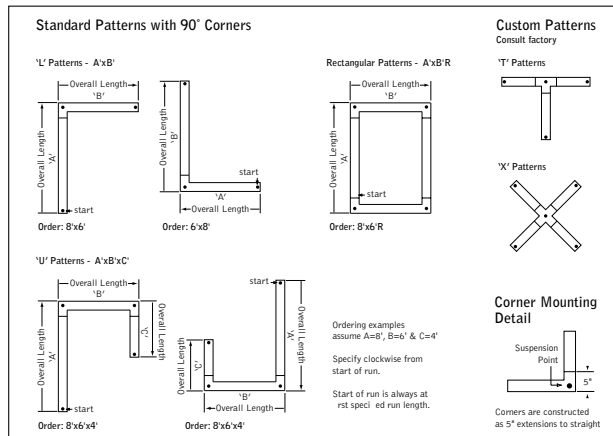
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December 2022 AK

fixture:

project:

## MOUNTING INFORMATION



## SPECIFICATIONS

## LED System

Proprietary linear LED module incorporates premium LEDs on a robust platform to achieve excellent thermal management. LEDs are placed to promote a uniform appearance. Available in 2700K, 3000K, 3500K or 4000K with CRI>80 or CRI>90, 3 SDCM. 3500K and 4000K with CRI>90 have a cyanosis observation index (COI) of 3.3 or less. LED modules and drivers are replaceable from below.

## Construction

One piece extruded aluminum housing. Cast aluminum end caps. 8' unit weight: 30 lbs.

## Optic

Reflectors fabricated of 22 Ga. steel finished in matte white powder coat. Extruded acrylic lens with satin finish, up to 8' continuous.

## Electrical

Luminaires are pre-wired with factory installed branch circuit wiring and over-molded quick connects. Standard 120-277V constant current driver includes 0-10V analog dimming. Power factor > .9. PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires. PoE runs require an independent PoE node and power feed for each luminaire section.

## Emergency

Emergency Battery output - 10 watts for 90 minutes. Maximum mounting height: 20 ft. Emergency Circuit with Connected Solutions (DLM1, LMFS1, LMFS1, NL1, ENL1, CLM1, NXE1, WLXP) shipped standard with leads to connect UL924 compliant device, by others.

## Labels

UL and cUL listed. Suitable for Dry or Damp Locations, indoor use only.

## Finish

Polyester powder coat applied over a multi-stage pre-treatment. Canopy and cord white as standard.

## Lumen Maintenance

Reported: L70 at >61,000 hours      Calculated: L70 at 385,000 hours  
L90 at >61,000 hours      L90 at 103,000 hours

Derived from EPA TM-21 calculator. Based on typical conditions, consult factory for additional data.

## Reliability

At Focal Point, our products are designed to stand the test of time. Each luminaire is engineered using superior components, manufactured with the utmost care and rigorously tested. Contact us for reliability data.

## Warranty

LED system rated for operation in ambient environments up to 25°C. 5-year limited warranty.

## 4' PERFORMANCE CHART

See page 3.

**QS 10 DAY** Options in orange qualify for the Quickship program. 1000' total. Refer to Quickship Guide for complete details including EM/EC options.

Focal Point LLC reserves the right to change specifications for product improvement without notification.

TYPE L3

ORDERING Luminaire Series	FSM2LS
Seem 2 LED	FSM2LS
<b>Shielding</b>	
Asymmetric Lens	AS
Batwing Lens	BW
Flush Satin Lens	FL
0.5" Pop-Down Lens	PD05
1.5" Pop-Down Lens (Individual units only)	PD15
<b>Lumen Output</b>	
125 Lumens per foot	125LF
250 Lumens per foot (2 minimum with L44)	250LF
375 Lumens per foot	375LF
500 Lumens per foot	500LF
625 Lumens per foot	625LF
750 Lumens per foot	750LF
875 Lumens per foot	875LF
1000 Lumens per foot	1000LF
<b>Color Temperature</b>	
2700K, 80+ CRI or 90+ CRI	27K or 927K
3000K, 80+ CRI or 90+ CRI	30K or 930K
3500K, 80+ CRI or 90+ CRI	35K or 935K
4000K, 80+ CRI or 90+ CRI	40K or 940K
<b>Circuits &amp; Zones</b>	
1 Circuit, non-emergency	1C
Consult Ordering Guide on page 5 for multiple circuiting and zoning options	C_Z_DL
<b>Voltage</b>	
120/277 UNV Volt	UNV
347V (LD1 & LT1 only)	347
Low voltage	LV
<b>Control System &amp; Dimming Level</b>	
0-10V - 10% Dimming	LD1
0-10V - 1% Dimming	LT1
Low Voltage, POE compatible (No driver. Not available with EMD or EC LV Voltage only)	LVN
Lutron Hi-Lume EcoSystem (LDE1) - 1% Dimming	LH1
DALI 1% Dimming (For 750LF, 875LF & 1000LF consult factory)	D11
Wattstopper DLM - 1% Dimming	DLM1
Wattstopper Fixture Sensor <sup>1</sup> Low Density - 1% Dimming	LMFS1
Wattstopper Fixture Sensor <sup>1</sup> High Density - 1% Dimming	LMFSD
Acuity nLight - 1% Dimming	NLT1
Enlighted Smart Sensor - 1% Dimming	ENL1
Enceelium CLM Connected Lighting Module - 1% Dimming	CLM1
Current NX Enabled - 1% Dimming	NXE1
WaveLinX Pro - 1% Dimming	WLXP
<b>Mounting</b>	
24" Cable Suspension	C24
48" Cable Suspension	C48
96" Cable Suspension	C96
(Specify canopy color White (WH), Black (BK) or Titanium Silver (TS). Example: C24WH.)	
J - for 2" canopies at non-feed locations. CS - for sloped ceiling applications.	
Surface Mount (Not available with CLM1, DLM1, NL1 or NXE1)	SM
<b>Factory Options</b>	
(See Ordering Guide on page 5 for ordering details for DC, EC, EM & ECD.)	
Black Cord	BKCD
Daylight Circuit	_DC
Emergency Circuit	_EC
Emergency Battery Pack <sup>1</sup>	_EM
Emergency Control Device <sup>1</sup> (3' minimum, 120/277 Volt only)	_ECD
<b>Finish</b>	
Black	BK
Titanium Silver	TS
Matte White Housing	WH
<b>Luminaire Length</b>	
1' increments (2' minimum. Leave blank for patterns. Smaller increments available, consult factory)	X'
<b>Pattern Options</b>	
(2' minimum length)	
'L' pattern	A' x B'
'U' pattern	A' x B' x C'
Rectangular pattern (Consult factory for other pattern options)	A' x B' R

FOR EMERGENCY  
FIXTURES ONLYPROVIDE LENGTHS AS  
INDICATED ON PLANS






Luminaire Length

1' increments

(2' minimum. Leave blank for patterns. Smaller increments available, consult factory)

TYPE L3

4' PERFORMANCE CHART

Lumen Output	Delivered Lumens	Tested System Watts	Lumens Per Watt (LPW)				
			 AS	 BW	 FL	 PD05	 PD15
125LF	500	6	95	91	88	81	82
250LF	1000	10	113	108	103	94	98
375LF	1500	14	120	116	105	101	100
500LF	2000	19	123	118	107	103	102
625LF	2500	24	121	116	105	101	101
750LF	3000	28	122	117	108	101	100
875LF	3500	34	120	115	104	100	100
1000LF	4000	39	119	114	105	101	100

Based on 3500K, 4' length, Lumen multipliers:  
Delivered lumens may vary +/- 5%. Actual wattage may vary +/- 5%

# Ordering Guide

**Direct Only Linear Circuitry, Zones & Factory Options****HOW TO USE THIS GUIDE**

Fill out the worksheet on the following page to specify your requirements for circuitry, zones, and factory options.

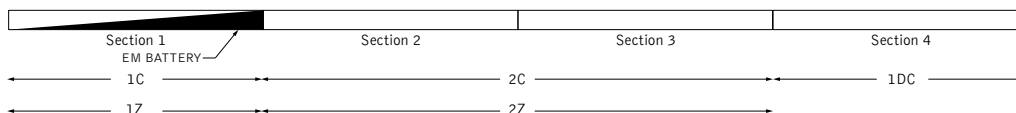
Refer to the run chart for standard run configurations, consult factory for custom configurations.

Complete the Totals / Ordering Codes at the bottom of the worksheet and add to your ordering logic on the cut sheet.

Submit the worksheet along with your order.

EXAMPLE	TOTAL RUN LENGTH: 32ft		JOB NAME:			FIXTURE TYPE:			
	HOUSING SECTION	SECTION LENGTH	SHARED ELECTRICAL FEED, NORMAL POWER			FACTORY OPTIONS			
						SEPARATE ELECTRICAL FEEDS			EM
			SWITCHING CIRCUIT	DIMMING ZONE	DAYLIGHT ZONE	DAYLIGHT CIRCUIT	EMERGENCY CIRCUIT	ECD	
	1	8	1C	1Z					1EM
	2	8	2C	2Z					
	3	8	2C	2Z					
	4	8				1DC			
	Totals / Ordering Codes		2C	2Z		1DC			1EM

ORDERING: FSM4L-FL-625LF-35K- 2C2Z -UNV-LD1-G2- 1DC-1EM -WH-32ft



KEY	
<b>C = Switching Circuit</b> Switched Hot / Shared Neutral	<b>DC = Daylight Circuit</b> Switched Hot / Separate Neutral
<b>Z = Dimming Zone</b> Dimming Control Wires	<b>EC = Emergency Circuit</b> Switched Hot / Separate Neutral
<b>DL = Daylight Zone</b> Daylight Dimming Control Wires	<b>EM = Emergency Battery</b> Unswitched Hot / Shared Neutral
	<b>ECD = Emergency Control Device</b> Unswitched Hot / Separate Neutral

**DEFAULTS**

- Zones and Factory Options illuminate entire sections from 4' to 8' in length.
- One shared or isolated circuit and zone required per housing section.
- Limit of one EM or ECD per housing section.
- Additional electrical feed required for applications greater than three shared circuits and zones.
- Each DC, EC and ECD require an additional electrical feed.
- ECD not available in the same housing section as EC.
- Longer lead times and additional pricing may apply for custom run configurations.

**CUSTOM LENGTHS**

- If partial illumination of emergency or daylight section is required, indicate in ordering guide and add "partial illumination" in Order Notes. Drawing required.
- Engineering validation required, longer lead times may apply.



PROJECT NAME: \_\_\_\_\_

TYPE: \_\_\_\_\_

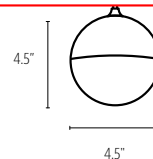


## Glowball™

PENDANT

## FEATURES

- AVAILABLE WITH TUNABLE WHITE AND RGBW LIGHT SOURCES
- ELEGANT & CONTEMPORARY SPHERE WITH ROBUST FROSTED SILICONE DIFFUSER
- FIXTURES CAN BE CLUSTERED TOGETHER TO CREATE LARGE SCALE INSTALLATIONS
- DIE-CAST ALUMINUM BODY
- FIELD REPLACEABLE LEDS AND DRIVERS
- AVAILABLE IN 80+ CRI AND 90+ CRI (R9>50)




TYPE L4  
ALTERNATE MANUFACTURERS:  
EUREKA "MEHA-MOD" SERIES  
HEMERA "NEUPTUNE MICRO-SUSPENSION" SERIES  
CDS LIGHTING "SNITCH" SERIES



## CATALOG CODES

GB1	B	04	FS	E	F	UNV	H	I	J
SERIES	HANGING SYSTEM	SIZE	DIFFUSER	FINISH	LIGHT SOURCE	VOLTAGE	OAH	CONTROL	OPTIONS

## SPECIFY CATALOG CODE

A	B	C	D	E
SERIES	HANGING SYSTEM	SIZE	DIFFUSER	FINISH
 GB1 GLOWBALL	<b>P1CF</b> PENDANT WITH 5.75" SURFACE MOUNT CANOPY, SINGLE SILVER POWER CORD; MOUNTS TO 4X4 OCTAGON J-BOX (BY OTHERS); <b>NOTE:</b> STATIC WHITE MOUNTING ONLY <b>P1FE</b> PENDANT WITH 6" FLAT CANOPY, SINGLE SILVER POWER CORD; MOUNTS TO OCL RECESSED J-BOX (PROVIDED BY OCL); <b>NOTE:</b> STATIC WHITE MOUNTING ONLY <b>P1HA</b> PENDANT WITH 8" SURFACE MOUNT CANOPY, SINGLE SILVER POWER CORD; MOUNTS TO 4X4 OCTAGON J-BOX (BY OTHERS); <b>NOTE:</b> TUNABLE WHITE OR RGBW MOUNTING ONLY <b>P1JA</b> PENDANT WITH 5" FLAT CANOPY, SINGLE SILVER POWER CORD; MOUNTS TO 4X4 OCTAGON J-BOX (BY OTHERS); REMOTE DRIVER ENCLOSURE	<b>04</b>	<b>FS</b> FROSTED SILICONE	<b>POWDER COAT FINISHES</b> <b>BKP</b> BLACK <b>BMP</b> BRASS METALLIC <b>BNP</b> BRONZE <b>BTP</b> BLACK TEXTURED <b>GRP</b> GRAPHITE <b>GLP</b> GOLDTASTIC <b>PREMIUM METAL FINISHES</b> <b>BAL</b> BRUSHED ALUMINUM <b>MWP</b> MATTE WHITE <b>SGP</b> STEEL GRAY <b>SMP</b> SILVER METALLIC <b>SWP</b> SKY WHITE <b>WTP</b> WHITE TEXTURED

F	G	H	I	J
LIGHT SOURCE	VOLTAGE	OAH*	CONTROL	OPTIONS
<b>LED OUTPUT LED1</b> <b>COLOR TEMP</b> (80+ CRI) 27K 30K <b>35K</b> 40K <b>COLOR TEMP</b> (90+ CRI) 927K 930K <b>935K</b> 940K	<b>UNV</b> 120-277	<b>48</b> 100 144	<b>DM1</b> 0-10V DIMMING 1% <b>DM8</b> DUAL 0-10V DIMMING 0.1% <b>NOTE:</b> REQUIRES <b>P1HA</b> OR <b>P1JA</b> HANGING SYSTEM <b>DALI</b> DALI TYPE 8 CONTROL SYSTEM, DIMMABLE TO 0.1% <b>NOTE:</b> REQUIRES <b>P1HA</b> OR <b>P1JA</b> HANGING SYSTEM <b>DMX</b> DMX CONTROL; DIMMABLE TO 0.1% <b>NOTE:</b> REQUIRES <b>P1HA</b> OR <b>P1JA</b> HANGING SYSTEM	<b>ULD</b> UL DAMP LABEL <b>BIOS</b> BIOS SKYBLUE™ OR BIOS SKYBLUE™ DYNAMIC LIGHT ENGINE** <b>MOD</b> MODIFIED LUMINAIRE (CONTACT LOCAL REP)
<b>TWH1</b>	TUNABLE WHITE 2700K - 5000K CRI 90+; R9 50+			
<b>RGBW</b>	RGBW			

SAMPLE CODE: GB1-P1CF-04-FS-BTP-LED1/35K-UNV-44-DM1

\* For Minimum OAH, see hanging systems details. Fixture will ship with one of three standard OAH's (48", 100" or 144") field adjustable to the desired height.

\*\*Contact factory for BIOS SkyBlue® or BIOS SkyBlue® Dynamic light engine and control options.

UP TO 79 LM/W

		04
<b>LED1</b>	LUMENS DELIVERED	635
	SYSTEM WATTAGE	8
<b>TWH1</b>	LUMENS DELIVERED	635
	SYSTEM WATTAGE	8

This chart was created for a 35K color temp. Multiply by 0.95 for 27k color temp, 0.97 for 30k color temp, and 1.03 for 40k color temp. Wattage and lumen data for **TWH1** approx, pending LM-79 testing; contact factory for **RGBW**.

Values shown for 80+ CRI. For 90+ CRI lumens use 0.85 multiplier.

## MODS, NOTES, &amp; COMMENTS



This product meets the material restrictions of Article 4 of the RoHS Directive (2011/65/EU), including Commission Delegated Directive 2015/863



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TYPE L4

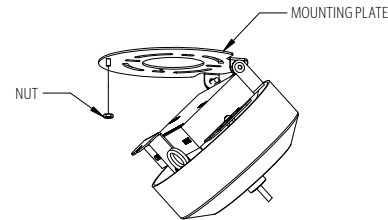
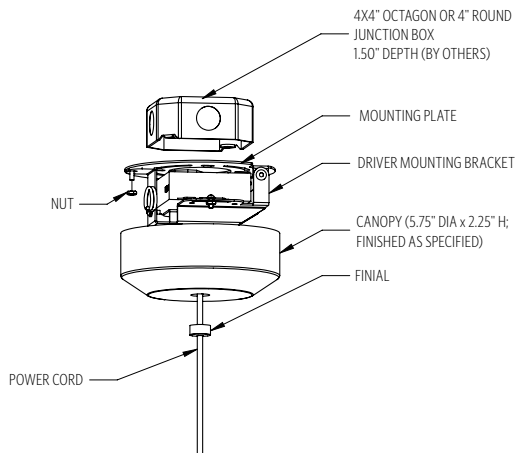
HANGING SYSTEM

**PICF** PENDANT WITH 5.75" SURFACE MOUNT CANOPY, SINGLE SILVER POWER CORD; MOUNTS TO 4X4 OCTAGON J-BOX (BY OTHERS);  
**NOTE:** STATIC WHITE MOUNTING ONLY

MOUNTING INFORMATION CHART

FIXTURE DIA.	FIXTURE WEIGHT	MIN/MAX OAH
04	3 LBS	10"/144"

PICF ships with one of three OAH's (48", 100" or 144") and is field adjustable to the desired height.

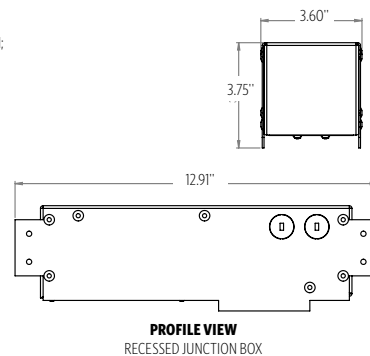
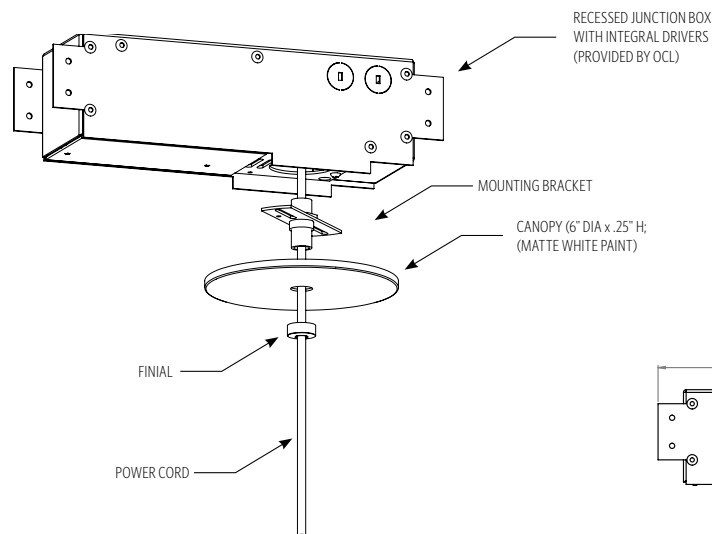


**PIFE** PENDANT WITH 6" FLAT CANOPY, SINGLE SILVER POWER CORD; MOUNTS TO OCL RECESSED J-BOX (PROVIDED BY OCL);  
**NOTE:** STATIC WHITE MOUNTING ONLY

MOUNTING INFORMATION CHART

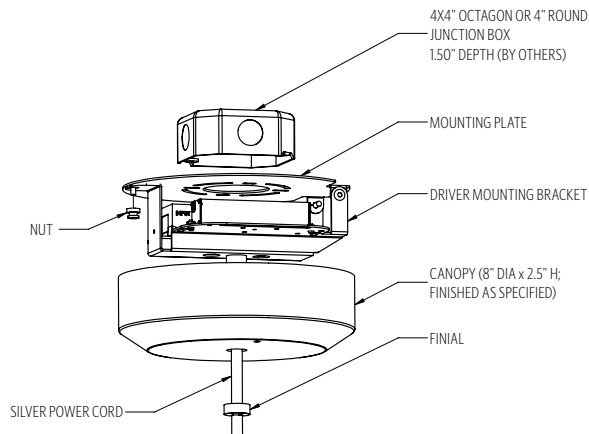
FIXTURE DIA.	FIXTURE WEIGHT	MIN/MAX OAH
04	3 LBS	10"/144"

PIFE ships with one of three OAH's (48", 100" or 144") and is field adjustable to the desired height.



TYPE L4

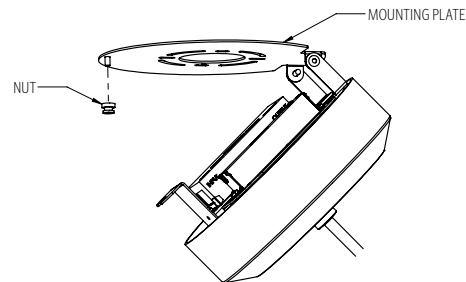
**PIHA** PENDANT WITH 8" SURFACE MOUNT CANOPY, SINGLE SILVER POWER CORD; MOUNTS TO 4X4 OCTAGON J-BOX (BY OTHERS);  
**NOTE:** TUNABLE WHITE OR RGBW MOUNTING ONLY



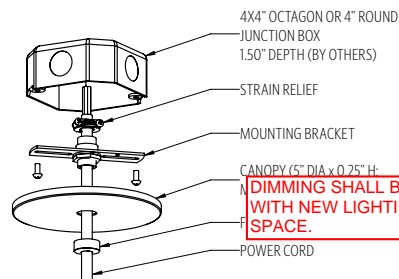
**MOUNTING INFORMATION CHART**

FIXTURE DIA.	FIXTURE WEIGHT	MIN/MAX OAH
O4	3 LBS	10"/144"

PIHA ships with one of three OAH's (48", 100" or 144") and is field adjustable to the desired height.

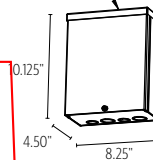


**PIJA** PENDANT WITH 5" FLAT CANOPY, SINGLE SILVER POWER CORD; MOUNTS TO 4X4 OCTAGON J-BOX (BY OTHERS); REMOTE DRIVER ENCLOSURE



**DIMMING SHALL BE COORDINATED WITH NEW LIGHTING CONTROLS IN SPACE.**

REMOTE DRIVER HOUSING ENCLOSURE (PROVIDED BY OCL)



**MOUNTING INFORMATION CHART**

FIXTURE DIA.	FIXTURE WEIGHT	MIN/MAX OAH
O4	3 LBS	10"/144"

PIJA ships with one of three OAH's (48", 100" or 144") and is field adjustable to the desired height.

PIJA will include ETL listed enclosure for remote mounting drivers. Max 30' distance from luminaire for **DM1, DM8, DALI** and **DMX**. Enclosure must remain accessible after installation.

**DIFFUSER**

**FINISH**

**FINISHES:**



**FS** FROSTED SILICONE

**METALLIC POWDER COAT FINISHES:**



**SMP**  
SILVER



**GRP**  
GRAPHITE



**SGP**  
STEEL GRAY



**GLP**  
GOLDTASTIC



**BMP**  
BRASS



**BNP**  
BRONZE

**PREMIUM METAL FINISHES:**



**BAL**  
BRUSHED ALUMINUM

**SOLID POWDER COAT FINISHES:**



**SWP**  
SKY WHITE



**MWP**  
MATTE WHITE



**BKP**  
BLACK

**TEXTURED POWDER COAT FINISHES:**



**BTP**  
BLACK TEXTURED



**WTP**  
WHITE TEXTURED

**RAL®, Pantone® or custom finishes are also available.**

These colors are for reference only. Please be aware that colors may vary per monitor. Contact your local rep for finish samples or with any questions.



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TYPE L4

## LIGHT SOURCE

LED1	04	
	LUMENS DELIVERED	635
TWH1	SYSTEM WATTAGE	8
	LUMENS DELIVERED	635
	SYSTEM WATTAGE	8

This chart was created for a 35K color temp. Multiply by 0.95 for 27k color temp, 0.97 for 30k color temp, and 1.03 for 40k color temp. Wattage and lumen data for **TWH1** approx. pending LM-79 testing.; contact factory for **RGBW**.

Values shown for 80+ CRI. For 90+ CRI lumens use 0.85 multiplier.

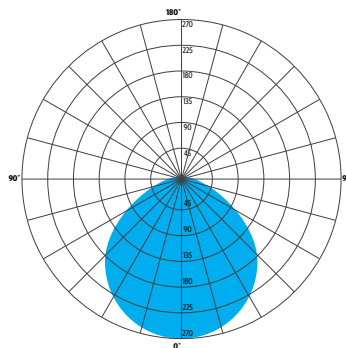
STANDARD COLOR TEMPERATURE OPTIONS	CRI (RA)	
2700K	80+	90+
3000K	80+	90+
3500K	80+	90+
4000K	80+	90+
TWH1	90+	
RGBW	N/A	

ZONE	LUMENS	% OF LUMINAIRE
0-30	165	26%
0-60	485	76%
0-90	610	96%
90-180	25	4%
0-180	635	100%

## PHOTOMETRY:

LUMINAIRE: GBI-PICF-04-FS-WTP-LED1\_35K-UNV-36-DM1  
COLOR TEMP #: 3500K  
EFFICACY: 79 LM/W  
TEST REPORT: TEST NO. 20859.0

For all available IES files, please visit our website at [ocl.com](http://ocl.com).



## CONTROL

## DM1 0-10V DIMMING 1%

- 0-10V DIMMING PROTOCOL
- 1% MINIMUM DIM LEVEL
- ELECTRONIC DRIVER
- POWER FACTOR >0.9
- THD <20%
- MINIMUM AMBIENT OPERATING TEMPERATURE -31°F
- LINEAR DIMMING CURVE
- FIELD REPLACEABLE

## DALI DALI CONTROL SYSTEM, DIMMABLE 0.1%

- DALI-2 DEVICE TYPE 6 CONTROL PROTOCOL
- 0.1% MINIMUM DIM LEVEL
- ELECTRONIC DRIVER
- POWER FACTOR >0.9
- THD <20%
- MINIMUM AMBIENT OPERATING TEMPERATURE -4°F
- LOGARITHMIC DIMMING CURVE [DEFAULT]
- FIELD REPLACEABLE

## DMX DMX CONTROL DIMMABLE TO 0.1%

- DMX/RDM DIMMING PROTOCOL 0.1% MINIMUM DIM LEVEL
- ELECTRONIC DRIVER
- POWER FACTOR >0.9
- THD <20%
- MINIMUM AMBIENT OPERATING TEMPERATURE -4°F
- LOGARITHMIC DIMMING CURVE [DEFAULT]
- FIELD REPLACEABLE

## DM8 DUAL 0-10V DIMMING 0.1%

- 0-10V DIMMING PROTOCOL
- 0.1% MINIMUM DIM LEVEL
- ELECTRONIC DRIVER
- POWER FACTOR >0.9
- THD <20%
- MINIMUM AMBIENT OPERATING TEMPERATURE -4°F
- LOGARITHMIC DIMMING CURVE [DEFAULT]
- FIELD REPLACEABLE

## OPTIONS

## ULD DAMP LABEL LUMINAIRE

- MAY BE USED IN AN OUTDOOR AREA THAT IS PROTECTED FROM DIRECT CONTACT WITH WIND, RAIN, SNOW OR EXCESSIVE MOISTURE

## MOD MODIFIED LUMINAIRE

- LUMINAIRE IS MODIFIED FROM STANDARD OPTIONS; CONTACT LOCAL REP FOR MORE INFORMATION

## BIOS

- BIOS SKYBLUE™ DYNAMIC** LIGHT ENGINE IS DIMMABLE AND FEATURES A SIMPLE APPROACH TO CIRCADIAN LIGHTING CONTROLS.
- WHEN PAIRED WITH THE BIOS BIO-DIMMING MODULE, IT OPERATES USING ANY SINGLE CHANNEL CONSTANT CURRENT (CC) LED DRIVER AND CAN BE USED WITH ANY STANDARD DIMMING INTERFACE/PROTOCOL (0-10V, ELV, DMX, WIRELESS) AND COULD WORK WITH EXISTING TWO-CHANNEL CONTROL SYSTEMS AS WELL.
- VISIT [OCL.COM/BIOS](http://ocl.com/bios) FOR MORE INFORMATION



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TYPE L4

## SPECIFICATIONS

### CONSTRUCTION

- HOUSING IS DIE-CAST ALUMINUM
- DIFFUSER IS FROSTED SILICONE
- CANOPY IS SPUN ALUMINUM
- HARDWARE IS ZINC PLATED OR STAINLESS STEEL

### MOUNTING

- **PICF PIHA** AND **PIJA** MOUNT TO 4X4" OCTAGON OR 4" ROUND J-BOX (BY OTHER)
- **PIFE** MOUNTS TO OCL PROPRIETARY RECESSED J-BOX WITH INTEGRAL DRIVER (PROVIDED BY OCL)

### ELECTRICAL

- DIMMING ELECTRONIC DRIVER(S), COMES STANDARD
- WITH 0-10V DOWN TO 1% [STATIC WHITE]
- BRIDGELLUX COB
- 80+ CRI = 80 RA, R9 > 0 (10-15 TYP.)
- 90+ CRI = 90 RA, R9 > 50
- **FOR INTEGRAL DRIVERS:** LUMINAIRE CONNECTS TO BUILDING SUPPLY (120V-277V 50/60HZ)
- **FOR REMOTE DRIVERS:** LUMINAIRE WIRE LEADS ARE LOW-VOLTAGE. THE WIRES SHOULD BE CONNECTED TO OCL PROVIDED REMOTE DRIVER ENCLOSURE ONLY!

### LISTING

- ETL LISTED TO UL 1598 FOR DRY LOCATIONS; DAMP LOCATION LISTED IS OPTION

### WARRANTY

- 5 YEAR; ALL ELECTRICAL COMPONENTS RETAIN THE MANUFACTURER'S WARRANTY

### SUSTAINABILITY

- THIS PRODUCT MEETS THE MATERIAL RESTRICTIONS OF ARTICLE 4 OF THE **ROHS** DIRECTIVE (2011/65/EU), INCLUDING COMMISSION DELEGATED DIRECTIVE 2015/863
- **BIOS** LIGHTING CONTRIBUTES TOWARD THE CIRCADIEN LIGHTING DESIGN FEATURE 54 UNDER THE **WELL BUILDING STANDARD™ V1** AND FEATURE L03 UNDER THE **WELL BUILDING STANDARD V2**

## COMMON MODIFICATIONS

### WE'RE BUILT FOR OUT-OF-THE-BOX THINKERS.

Nearly 50% of OCL fixtures we manufacture have some type of modification. Here is a list of common modifications we frequently produce. **Please contact the factory for modifications specific to your fixture or project.**

Need some help? Simply send your questions to us at **OCL-Quotes@ocl.com**

- BIOS, TUNABLE WHITE, WARM-DIM, & RGBW LIGHT SOURCES
- SPECIFIC LUMEN OUTPUT
- MODIFIED CLUSTERS OR CONFIGURATIONS / MULTI-DROP CANOPIES
- VARIOUS SHAPES, ARCS, AND CURVES FOR LINEAR PROFILES AND RINGS
- CEILING OR SURFACE MOUNTING
- LARGE SCALE MODIFICATIONS
- RAL, PANTONE, BRAND-SPECIFIC, RETIRED OCL COLOR, OR CUSTOM FINISHES



- EMERGENCY BATTERY BACKUP OR INVERTER OPTIONS
- REMOTE DRIVERS / EXTENDED DISTANCE REMOTE DRIVERS
- DIMMING TO 0.1% (DIM TO DARK)
- NON-STANDARD SIZES OR LENGTHS
- NON-STANDARD CANOPY, BODY AND/OR CORD COLORS
- SEISMIC AND/OR ANTI-SWAY SYSTEMS
- RIGID STEMS
- MODIFIED OVERALL HEIGHTS (LONGER OR SHORTER OAH)
- UPLIGHT ADDITIONS
- LASER ETCHING, ENGRAVING, AND CUTOUTS

The drawings and specifications and ideas, designs and arrangements represented on these drawings are and shall remain the property of The Original Cast Lighting (OCL Architectural Lighting) and no part thereof shall be copied, disclosed, to others or used in conjunction with any work or project other than the specified project for which they have been prepared and developed, without written consent of OCL. Visual contact with these plans or specifications shall constitute conclusive evidence of acceptance of these restrictions. All specifications and information subject to change without notice.



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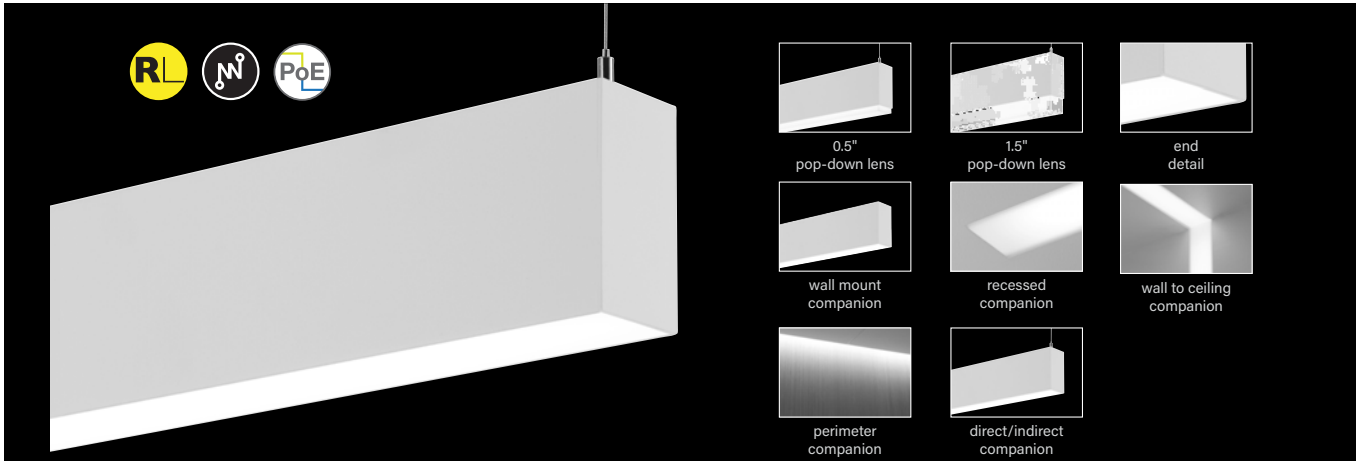
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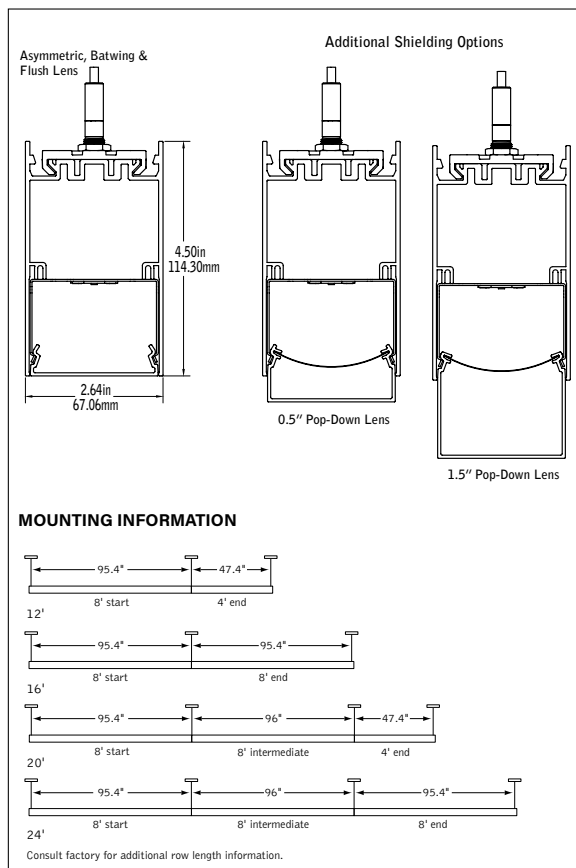
# Seem® 2

LED

TYPE L5  
ALTERNATE MANUFACTURERS:  
PRUDENTIAL "BIONICPRO2" SERIES  
FORUM "ALUMINA" SERIES  
LUXILLUMINAIRE "EOS 2.0" SERIES



## DIMENSIONAL DATA



## FEATURES

Narrow 2.5" linear direct LED with Asymmetric, Batwing, Flush, 0.5" or 1.5" Pop-Down lens.

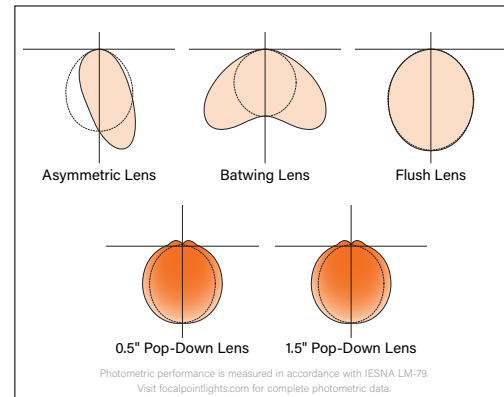
Frosted acrylic lens provides uninterrupted illumination, without pixels or shadows.

Individual units and continuous runs in 1' increments.

Connected Solutions: Integrates with wired and wireless building lighting control systems.

PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires.

## DISTRIBUTIONS



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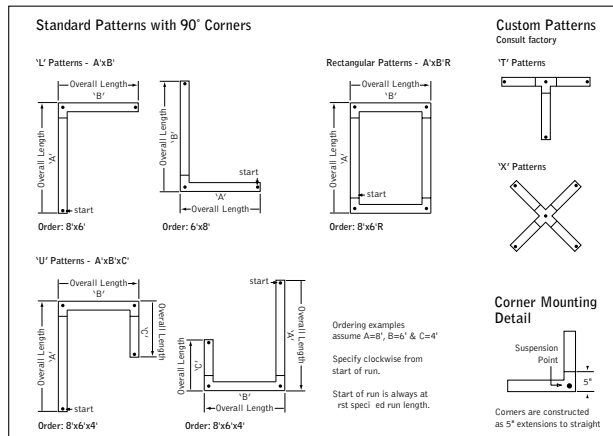
Focal Point LLC | 4141 S. Pulaski Rd, Chicago, IL 60632 | 773.2479494 | [focalpointlights.com](http://focalpointlights.com)

December 2022 AK

fixture:

project:

## MOUNTING INFORMATION



## SPECIFICATIONS

## LED System

Proprietary linear LED module incorporates premium LEDs on a robust platform to achieve excellent thermal management. LEDs are placed to promote a uniform appearance. Available in 2700K, 3000K, 3500K or 4000K with CRI>80 or CRI>90, 3 SDCM. 3500K and 4000K with CRI>90 have a cyanosis observation index (COI) of 3.3 or less. LED modules and drivers are replaceable from below.

## Construction

One piece extruded aluminum housing. Cast aluminum end caps. 8' unit weight: 30 lbs.

## Optic

Reflectors fabricated of 22 Ga. steel finished in matte white powder coat. Extruded acrylic lens with satin finish, up to 8' continuous.

## Electrical

Luminaires are pre-wired with factory installed branch circuit wiring and over-molded quick connects. Standard 120-277V constant current driver includes 0-10V analog dimming. Power factor > .9. PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires. PoE runs require an independent PoE node and power feed for each luminaire section.

## Emergency

Emergency Battery output - 10 watts for 90 minutes. Maximum mounting height: 20 ft. Emergency Circuit with Connected Solutions (DLM1, LMFS1, LMFS1, NL1, ENL1, CLM1, NXE1, WLXP) shipped standard with leads to connect UL924 compliant device, by others.

## Labels

UL and cUL listed. Suitable for Dry or Damp Locations, indoor use only.

## Finish

Polyester powder coat applied over a multi-stage pre-treatment. Canopy and cord white as standard.

## Lumen Maintenance

Reported: L70 at >61,000 hours  
L90 at >61,000 hours

Calculated: L70 at >61,000 hours  
L90 at >61,000 hours

Derived from EPA TM-21 calculator. Based on typical conditions, consult factory for additional data.

## Reliability

At Focal Point, our products are designed to stand the test of time. Each luminaire is engineered using superior components, manufactured with the utmost care and rigorously tested. Contact us for reliability data.

## Warranty

LED system rated for operation in ambient environments up to 25°C. 5-year limited warranty.

## 4' PERFORMANCE CHART

See page 3.



Options in orange qualify for the Quickship program. 1000' total.  
Refer to Quickship Guide for complete details including EM/EC options.

Focal Point LLC reserves the right to change specifications for product improvement without notification.

TYPE L5

## ORDERING

## Luminaire Series

## FSM2LS

Seem 2 LED

FSM2LS

## Shielding

Asymmetric Lens

AS

Batwing Lens

BW

Flush Satin Lens

FL

0.5" Pop-Down Lens

PD05

1.5" Pop-Down Lens

PD15

(Individual units only)

## Lumen Output

125 Lumens per foot

125LF

250 Lumens per foot

250LF

375 Lumens per foot

375LF

500 Lumens per foot

500LF

625 Lumens per foot

625LF

750 Lumens per foot

750LF

875 Lumens per foot

875LF

1000 Lumens per foot

1000LF

## Color Temperature

2700K, 80+ CRI or 90+ CRI

27K or 927K

3000K, 80+ CRI or 90+ CRI

30K or 930K

3500K, 80+ CRI or 90+ CRI

35K or 935K

4000K, 80+ CRI or 90+ CRI

40K or 940K

## Circuits &amp; Zones

1 Circuit, non-emergency

1C

Consult Ordering Guide on page 5 for multiple  
circuiting and zoning options

## Voltage

120/277 UNV Volt

UNV

347V

347

(LD1 &amp; LT1 only)

Low voltage

LV

## Control System &amp; Dimming Level

0-10V - 10% Dimming

LD1

0-10V - 1% Dimming

LT1

Low Voltage, POE compatible

LVN

(No driver. Not available with EMD or EC LV Voltage only)

Lutron Hi-Lume EcoSystem (LDE1) -

LH1

1% Dimming

D11

DALI 1% Dimming

DLM1

(For 750LF, 875LF &amp; 1000LF consult factory)

Wattstopper DLM - 1% Dimming

DLM1

Wattstopper Fixture Sensor<sup>1</sup>

LMFS1

Low Density - 1% Dimming

LMFSD

Wattstopper Fixture Sensor<sup>1</sup>

LMFSD

High Density - 1% Dimming

LMFSD

Acuity nLight - 1% Dimming

NL1

Enlighted Smart Sensor - 1% Dimming

ENL1

(Specify one of the following in place of "C"

2" canopies at non-feed locations. CS - for sloped ceiling applications)

Enceelium CLM Connected Lighting Module -

CLM1

1% Dimming

NXE1

Current NX Enabled - 1% Dimming

WLXP

WaveLinX Pro - 1% Dimming

WLXP

Mounting

24" Cable Suspension

C24

48" Cable Suspension

C48

96" Cable Suspension

C96

(Specify one of the following in place of "C"

2" canopies at non-feed locations. CS - for sloped ceiling applications)

Surface Mount

SM

(Not available with CLM1, DLM1, NL1 or NXE1)

## Factory Options

(See Ordering Guide on page 5 for ordering details for DC, EC, EM & ECD.)

Black Cord

BKCD

Daylight Circuit

DC

Emergency Circuit

EC

Emergency Battery Pack<sup>1</sup>

EM

Emergency Control Device<sup>1</sup>

ECD

(3' minimum, 120/277 Volt only)

## Finish

Black

BK

Titanium Silver

TS

Matte White Housing

WH

## Luminaire Length

5' row length in 1' increments

X'

(2' minimum. Leave blank for patterns.

Smaller increments available, consult factory)

## Pattern Options

(2' minimum length)

'L' pattern

A' x B'

'U' pattern

A' x B' x C'

Rectangular pattern

A' x B' R

(Consult factory for other pattern options)






FIXTURE SHALL BE MOUNTED  
ON SMALL ANGLE. CENTER  
PENDANT DROP HEIGHT 6"  
EXTERIOR DROP HEIGHT 2"

FOR EMERGENCY  
FIXTURES ONLY

PROVIDE LENGTHS AS  
INDICATED ON PLANS

TYPE L5

4' PERFORMANCE CHART

Lumen Output	Delivered Lumens	Tested System Watts	Lumens Per Watt (LPW)				
			 AS	 BW	 FL	 PD05	 PD15
125LF	500	6	95	91	88	81	82
250LF	1000	10	113	108	103	94	98
375LF	1500	14	120	116	105	101	100
500LF	2000	19	123	118	107	103	102
625LF	2500	24	121	116	105	101	101
750LF	3000	28	122	117	108	101	100
875LF	3500	34	120	115	104	100	100
1000LF	4000	39	119	114	105	101	100

Based on 3500K, 4' length, Lumen multipliers:  
Delivered lumens may vary +/- 5%. Actual wattage may vary +/- 5%

# Ordering Guide

**Direct Only Linear Circuitry, Zones & Factory Options****HOW TO USE THIS GUIDE**

Fill out the worksheet on the following page to specify your requirements for circuitry, zones, and factory options.

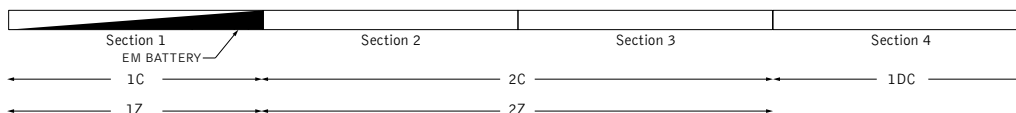
Refer to the run chart for standard run configurations, consult factory for custom configurations.

Complete the Totals / Ordering Codes at the bottom of the worksheet and add to your ordering logic on the cut sheet.

Submit the worksheet along with your order.

EXAMPLE	TOTAL RUN LENGTH: 32ft		JOB NAME:			FIXTURE TYPE:			
	HOUSING SECTION	SECTION LENGTH	SHARED ELECTRICAL FEED, NORMAL POWER			FACTORY OPTIONS			
						SEPARATE ELECTRICAL FEEDS			EM
			SWITCHING CIRCUIT	DIMMING ZONE	DAYLIGHT ZONE	DAYLIGHT CIRCUIT	EMERGENCY CIRCUIT	ECD	
	1	8	1C	1Z					1EM
	2	8	2C	2Z					
	3	8	2C	2Z					
	4	8				1DC			
	Totals / Ordering Codes		2C	2Z		1DC			1EM

ORDERING: FSM4L-FL-625LF-35K- 2C2Z -UNV-LD1-G2- 1DC-1EM -WH-32ft



KEY	
<b>C = Switching Circuit</b> Switched Hot / Shared Neutral	<b>DC = Daylight Circuit</b> Switched Hot / Separate Neutral
<b>Z = Dimming Zone</b> Dimming Control Wires	<b>EC = Emergency Circuit</b> Switched Hot / Separate Neutral
<b>DL = Daylight Zone</b> Daylight Dimming Control Wires	<b>EM = Emergency Battery</b> Unswitched Hot / Shared Neutral
	<b>ECD = Emergency Control Device</b> Unswitched Hot / Separate Neutral

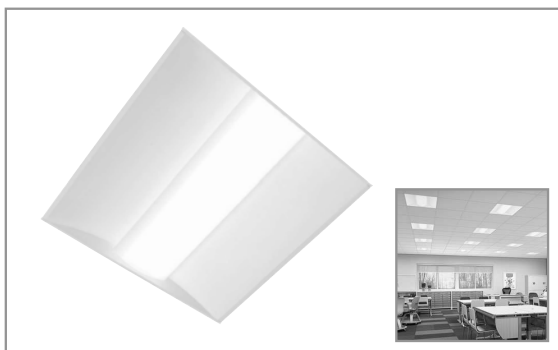
**DEFAULTS**

- Zones and Factory Options illuminate entire sections from 4' to 8' in length.
- One shared or isolated circuit and zone required per housing section.
- Limit of one EM or ECD per housing section.
- Additional electrical feed required for applications greater than three shared circuits and zones.
- Each DC, EC and ECD require an additional electrical feed.
- ECD not available in the same housing section as EC.
- Longer lead times and additional pricing may apply for custom run configurations.

**CUSTOM LENGTHS**

- If partial illumination of emergency or daylight section is required, indicate in ordering guide and add "partial illumination" in Order Notes. Drawing required.
- Engineering validation required, longer lead times may apply.

Project		Catalog #		<b>TYPE L6</b> <b>ALTERNATE MANUFACTURERS:</b> <b>LITHONIA "2BLT2" SERIES</b> <b>COLUMBIA "LCAT22" SERIES</b> <b>HE WILLIAMS "PT LED" SERIES</b>	
Prepared by		Notes			Date



## Metalux

### Cruze ST 22CZ2

2' x 2' LED Specification Grade Troffer

#### Typical Applications

Office • Education • Healthcare • Hospitality • Retail

#### Interactive Menu

- Order Information page 2
- Photometric Data page 3
- Connected Systems page 4
- VividTune™ Color Tuning Solutions page 5
- Product Warranty

#### Product Certification



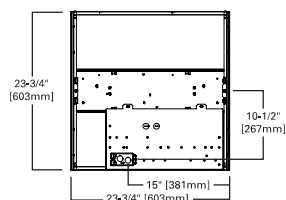
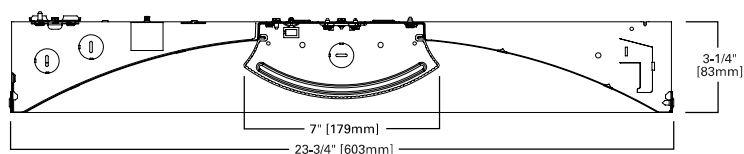
#### Product Features



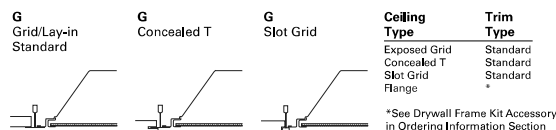
#### Top Product Features

- Latch-less design provides clean architectural look
- VividTune CCT tuning options from 3000K-5000K or 2700K-6500K
- Designers delight - ribbed, smooth and round perforated lens options
- High performance efficacy up to 138 lm/W
- Integrated sensor systems - occupancy, daylight and IoT connectivity

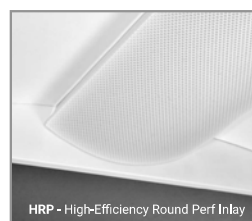
#### Dimensional and Mounting Details



#### Ceiling Compatibility



#### Shielding



See ordering information for more shielding options.

## Metalux

22CZ2 LED

TYPE L6

## Order Information

SAMPLE ORDER NUMBER: 22CZ2-34HE-UNV-L835-CD1-U

FOR EMERGENCY  
FIXTURES ONLY

Rating	Series	Lumen Output	Shielding	Voltage	Options	Emergency Options
Rating	Series	Lumen Output	Shielding	Voltage <sup>(2)</sup>	Options	Emergency Options
[Blank]=Standard ATW-SW4 Chicago Rated	22CZ2-2x2 Cruze ST	<b>High Efficacy</b> 20HE=2000 Lumens <sup>(1)(8)</sup> 24HE=2400 Lumens <sup>(1)(8)</sup> 29HE=2900 Lumens 34HE=3400 Lumens 39HE=3900 Lumens 44HE=4400 Lumens  <b>Standard Efficacy</b> 20=2000 Lumens <sup>(8),(10)</sup> 24=2400 Lumens <sup>(8),(10)</sup> 32=3200 Lumens <sup>(8)</sup> 39=3900 Lumens <sup>(8)</sup> 44=4400 Lumens <sup>(8)</sup>	[Blank]=Ribbed Frosted Acrylic Lens (standard) S=Smooth Frosted Acrylic Lens RDP=Smooth Lens with Round Pattern Insert HRP=High- Efficiency Round Perf Inlay	UNV=Universal Voltage 120-277 347V=347 Volt <sup>(8)</sup> 48V=48 Volt Low-voltage (Class 2) <sup>(2)</sup>	GL=Single Element Fuse GM=Double Element Fuse	[Blank]=No emergency ELV7=7-watt, 120V-277V emergency battery pack installed <sup>(8)</sup> EL14W=14-watt 120V-277V emergency battery pack installed <sup>(8)</sup> ELV7W=7-watt, DLVP-compatible low voltage emergency battery pack installed <sup>(8)</sup> ELV14W=14-watt DLVP-compatible low voltage emergency battery pack installed <sup>(8)</sup> GTR2=Generator Transfer Relay <sup>(7)</sup> ETRD=Emergency Transfer Relay with dimming control <sup>(8)</sup>
		<b>Notes</b> (8) White tuning not available with this model. (10) Not compatible with WN driver.			<b>Notes</b> (2) Products also available in non-US voltages and frequencies for international markets. (5) 347 versions 6000 lumens and below are available with emergency options. S3HD and step-dim options or sensors are not available. (C) Consult DLVP system pages for additional details and compatibility.	<b>Notes</b> (3) With integral test switch/indicator/laser test. For approximate delivered lumens multiply the lumens per watt of the desired fixture by the wattage of the emergency battery pack (100 lm/W x 7=7000 lumens). IES-format photometry for luminaires under emergency operation available. Battery option increases total height by 1 inch. (6) Used to bypass local control during outage. Must be used in conjunction with UL 1008 device (provided by others). GTR2 option includes 2 relays on fixtures with dimming drivers. ETRD option only requires one relay when used on a dimming fixture. Must specify voltage as 120V or 277V when ordering these devices. 347 not available. (7) White tuning provides correlated color temperatures (CCT) between 3000K (warm) to 5000K (cool) or 2700K (warm) to 6500K (cool). Must be used in conjunction with W2A driver only. Must be used with two (2) 10V dimming control channels, 1 color, 1 intensity. Not compatible with other control or sensor options. Must be used in conjunction with W2A driver only. Must be used with two (2) 10V dimming control channels, 1 color, 1 intensity. Not compatible with other control or sensor options. (C) Consult DLVP system pages for additional details and compatibility.

CRI/CCT	Flex	Driver Type	Number of Drivers
CRI/CCT	Flex	Driver Type	Number of Drivers
L830=80CRI, 3000K L835=80CRI, 3500K L840=80CRI, 4000K L850=80CRI, 5000K L930=90CRI, 3000K L935=90CRI, 3500K L940=90CRI, 4000K L950=90CRI, 5000K L83050=80CRI 3000K-5000K White Tuning <sup>(7)</sup> L93050=90CRI 3000K-5000K White Tuning <sup>(7)</sup> L82765=80CRI 2700K-6500K White Tuning <sup>(7)</sup> L92765=90CRI 2700K-6500K White Tuning <sup>(7)</sup>	[Blank]=No Flex A3/8-4/18GDM=3/8" Flex with 0-10V Dimming Leads A3/8-2/18G=3/8" Flex with line and common A3/8-5/18GDM=Flex with 0-10V Dimming leads and Blue for alternate wiring. See below for details.	CD=0-10V Dimming Driver (1%-100% Dimming) SR=Sensor-ready Dimming Driver for LWP-D1 option (1%-100% Dimming) <sup>(8)</sup> SLTD=5th Light Dimming Driver (5%-100% Dimming) <sup>(8)</sup> SLTD=5th Light Dimming Driver (1%-100% Dimming) <sup>(8)</sup> LV=DLVP Dimming Driver (0%-100% Dimming) <sup>(8)</sup> SD=Step Dimming Driver (50%-100% Dimming) LH=Lutron HiLume (LDE1 series) 1%-100% EcoSystem Driver with Soft-on Fade to Black dimming <sup>(7)</sup> LS=Lutron 5 Series (LDE5-Series) 5%-100% EcoSystem Driver <sup>(7)</sup> W2A = White Tuning, 2 ch, Analog 0-10V Intensity and CCT Control <sup>(7)</sup> WN=WaveLinx Wireless Fixture, No Sensor. <sup>(4),(6),(9)</sup>	1=1 Driver
<b>Notes</b> (7) White tuning provides correlated color temperatures (CCT) between 3000K (warm) to 5000K (cool) or 2700K (warm) to 6500K (cool). Must be used in conjunction with W2A driver only. Must be used with two (2) 10V dimming control channels, 1 color, 1 intensity. Not compatible with other control or sensor options.		<b>Flexible Metal Conduit Options</b> Flex options available for 0-10V dimming control, DALI dimming control, emergency and night light functions. 72-inch factory-installed and pre-wired to driver, fitted to luminaire housing access plate with 90° enclosed FMC connector. Not all options may be combined and installation ratings vary by type. A3/8-4/18GDM series notes: Factory installed dimming option 3/8" flexible metal conduit with 2-#18 power and ground wires and 2-#18 UL-listed jacketed 0-10V +/- control wires. Meets UL 66, 85, 1479, 1569, 1581, 2556. NEC® 250.118, 300.22(C), 392, 396, 330, 501, 502, 503, 530, 504, 505, 518, 520, 530, 545, 72; Federal Specification A-C-99544 (formerly J-C-9308); all applicable OSHA and HUD Requirements. UL Classified 1-, 2-, and 3-hour through penetration with applicable fire stop product (not included). May be surface mounted, fished and/or embedded in plaster. Cable tray and approved raceway rated, install per NEC®, Environmental Air-handling Space Installation per NEC®, 300.22(C).	<b>Notes</b> (7) White tuning provides correlated color temperatures (CCT) between 3000K (warm) to 5000K (cool) or 2700K (warm) to 6500K (cool). Must be used in conjunction with W2A driver only. Must be used with two (2) 10V dimming control channels, 1 color, 1 intensity. Not compatible with other control or sensor options. Integrated options must be used in conjunction with the associated system and may not be compatible with other options or accessories. Please refer to the following: (A) Consult WaveLinx system pages for additional details and compatibility. (B) Consult LumaWatt Pro system pages for additional details and compatibility. (C) Consult DLVP system pages for additional details and compatibility. (D) Consult LumaWatt Pro system pages for additional details and compatibility. (E) Consult Fifth Light system pages for additional details and compatibility. (F) Consult Marketplace Options - Lutron system pages for additional details and compatibility. Compatible only with driver series shown, and may require two or more drivers. Requires field commissioning to operate or dim. Contact Lutron at www.lutron.com. (G) Not compatible with emergency or integrated sensor options. (H) Available with UNV voltage only.

Integrated Sensing Systems	Packaging	Accessories
Integrated Sensing Systems	Packaging	Accessories (order separately)
[Blank]=No Sensor SWPD1=WaveLinx Wireless Integrated Sensor <sup>(4)</sup> SDWP1=WaveLinx Wireless Integrated Sensor Dual Band <sup>(4),(4)</sup> LWIPD1=LumaWatt Pro Wireless Integrated Sensor <sup>(8)</sup> LDWP1=LumaWatt Pro Wireless Integrated Sensor Dual Band <sup>(8),(4)</sup> LWTPD1=LumaWatt Pro Wireless Tile-mount Sensor <sup>(8)</sup> SLVPD1=DLVP Low-voltage Integrated Sensor <sup>(2)</sup> SDLPD1=DLVP Low-voltage Integrated Sensor Dual Band <sup>(2),(4)</sup> SVDPD1=0-10V Stand-alone Integrated Sensor <sup>(9)</sup> SDVPD1=0-10V Stand-alone Integrated Sensor Dual Band <sup>(9),(4)</sup>	U=Unit Pack PAL=Job Pack, out of carton PALC=Job Pack, in carton	CZ2-EQCLIP-U-PK=Cruze Plus "CZ2" Earthquake Clip Kit (4 clips per bag kit) <sup>(1)</sup> DF-22-W=2' x 2' Drywall Frame Kit SK-22-WS=2' x 2' Shallow Surface Mount Kit SK-22-WT=2' x 2' Tall Surface Mount Kit ISHH-01=Programming Remote for Integrated Sensor <sup>(3)</sup> ISHH-02=Personal Control Remote for Integrated Sensor <sup>(3)</sup>
<b>Notes</b> (4) Required for use with sensors and emergency options. Provides blank band on opposite side from sensor band to provide symmetric appearance. Integrated options must be used in conjunction with the associated system and may not be compatible with other options or accessories. Please refer to the following: (A) Consult WaveLinx system pages for additional details and compatibility. (B) Consult LumaWatt Pro system pages for additional details and compatibility. (C) Consult DLVP system pages for additional details and compatibility. (D) Consult SVDP series system pages for additional details and compatibility.		<b>Notes</b> (1) An EQ Grid Clip is recommended for all 9/16" ceiling systems. Four required per fixture. Integrated options must be used in conjunction with the associated system and may not be compatible with other options or accessories. Please refer to the following: (D) Consult SVDP series system pages for additional details and compatibility.

## Metalux

## 22CZ2 LED

TYPE L6

### Product Specifications

#### Construction

- Die formed of code gauge prime cold rolled steel with full length die-formed stiffeners
- Unibody endplates attached with interlocking tabs and screws
- Hemmed side flanges
- Four auxiliary fixture end suspension points
- Integral Grid-lock feature for endplates for added safety
- Optional earthquake clips available

#### Integrated Controls

- 0-10V dimming to 1% standard
- WaveLinx wireless fixture for sensor-less wireless control
- WaveLinx sensor compatible for IoT capability
- LumaWatt Pro sensor compatible for IoT capability
- SVPD sensor compatible for out of the box functionality
- DLVP sensor and driver compatible for low voltage applications
- DALI 2.0, Lutron, and step-dimming available

#### LED and Light Engine

- LED's available in 3000K, 3500K, 4000K, or 5000K at 80 CRI minimum and 90 CRI minimum
- TM21 life at 60,000 hours up to L94 and calculated L70 exceeds 290,000 hrs.
- Drivers available in 120-277V and 347V
- Color Tuning options available with Eaton's VividTune

#### Emergency Battery Options

- Optional 120-277V emergency battery available in 7W or 14W
- 90-minute backup period for code compliance
- Test switch with laser pointer and testing from floor feature for ease of use
- EZ Key feature prevents accidental discharge during construction
- Generator transfer options available

#### Finish

- Multistage, iron phosphate pretreatment
- 90% reflective, matte white enamel finish
- Full fixture housing painted after fabrication

#### Shielding

- Ribbed acrylic frosted lens standard
- Optional smooth acrylic frosted lens (S)
- Optional metal perforated acrylic lens (RDP)
- Optional High-Efficiency Round Perf Inlay (HRP)

#### Compliance

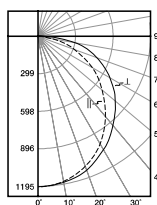
- IC rated for insulation contact
- cULus listed for damp locations
- RoHS compliant
- Tested to IESNA LM-79 and LM-80
- Stated life tested to TM21 standards
- Can be used for State of California Title 24 high efficacy luminaire

#### Warranty

- Five year warranty standard.

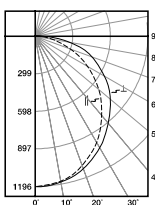
### Photometric Data

[View IES files](#)



#### 22CZ2-24-UNV-L830-CD1-U

Dimming Driver  
Linear LED 3000K  
Spacing criterion: (II) 1.2 x mounting height, (⊥)  
1.28 x mounting height  
Lumens: 2437  
Input Watts: 21.9W  
Efficacy: 111.3 LPW  
Test Report: 22CZ2-24-UNV-L830-CD1-U.IES



#### 22CZ2-24HE-UNV-L830-CD1-U

Dimming Driver  
Linear LED 3000K  
Spacing criterion: (II) 1.19 x mounting height, (⊥)  
1.27 x mounting height  
Lumens: 2402  
Input Watts: 19.2W  
Efficacy: 125.1 LPW  
Test Report: 14CZ2-29-UNV-L830-CD1-U.IES



## Metalux

## 22CZ2 LED

TYPE L6

### Energy and Performance Data

#### Standard Efficacy Versions – Single Row of LEDs

Catalog Number	Lumens	Watts	lm/W
22CZ2-20-UNV-L835-CD1-U	2101	17.9	117
22CZ2-24-UNV-L835-CD1-U	2450	21.9	112
22CZ2-32-UNV-L835-CD1-U	3280	26.7	123
22CZ2-39-UNV-L835-CD1-U	3943	34.5	114
22CZ2-44-UNV-L835-CD1-U	4424	42.7	104

#### High Efficacy Versions – Two Rows of LEDs

Catalog Number	Lumens	Watts	lm/W
22CZ2-20HE-UNV-L835-CD1-U	2044	16.0	128
22CZ2-24HE-UNV-L835-CD1-U	2416	19.2	126
22CZ2-29HE-UNV-L835-CD1-U	2942	22.2	133
22CZ2-34HE-UNV-L835-CD1-U	3386	25.8	131
22CZ2-39HE-UNV-L835-CD1-U	3930	30.3	130
22CZ2-44HE-UNV-L835-CD1-U	4464	25.0	128

#### Shielding

Lumen Adjustment Factors		
S	RDP	HRP
1.05	0.67	0.80

#### Lumen Calculator

CCT Multiplier	80 CRI	90 CRI
3000K	0.994	0.830
3500K	1.00	0.845
4000K	1.00	0.854
5000K	1.065	0.852

#### Example of Lumen Adjustment Calculation

22CZ2-32-UNV-L935-CD1-U at 90CRI at 3500K

Lumen Adjustment Factor = 0.845

Total Light Output =

3,280 lm x 0.845 = 2,772 lm

Efficacy =  $\frac{2,772 \text{ lm}}{26.7 \text{ W}}$  103.8 lm/W

#### Lumen Maintenance

Version	TM-21 Lumen Maintenance (60,000 hours)	Theoretical L70 (hours)
Standard	> 85%	> 131,000
High Efficiency	> 94%	> 290,000

#### Load Data (Stock Product)

Thd	6%
Power Factor	0.99
Weight (lbs.)	10.6
Low Temp. Start	-20°C

#### Shipping Data

Catalog No.	Wt.	Pallet 49" L x 52" W x 55" H
2' x 2'	12.5 lbs.	48

## Metalux

22CZ2 LED

TYPE L6

### Control Systems

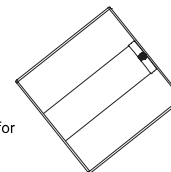
- WaveLinX
- DLVP
- LumaWatt Pro
- iLumin Plus
- VividTune

The Cruze ST with Integrated Sensor technology provides automatic energy savings without sacrificing performance. Traditionally, these types of energy savings required coordination between the luminaire and a lighting control system. The Cruze ST delivers superior lighting with integrated occupancy and daylighting controls.

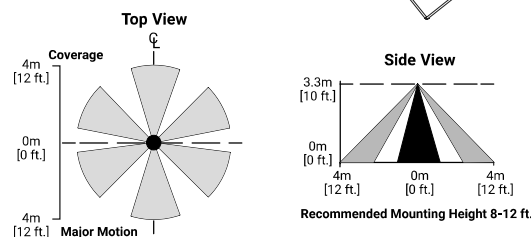
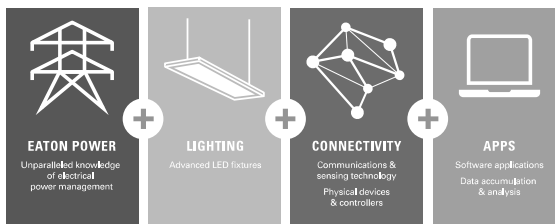
Capture the benefits of traditional lighting controls, without complicated coverage planning or special wiring. Ideal for new construction or retrofit, the Cruze ST delivers automatic ON to an energy saving light level, while ensuring lighting is turned OFF when the space is unoccupied.

The integral daylight sensor reduces the need for special daylight zone planning. Each luminaire will automatically adjust the light level based on reflected light beneath the sensor in a closed loop method.

The integral sensor can be offered in both standalone (SVPD1) and networked (SWPD1, LWIPD1, and SLVPD1) for application versatility.



### We make connections work



Installation of integrated sensors within 3-ft (1m) of HVAC air vents is not recommended.

### Systems comparison chart

Eaton provides many lighting system solutions designed to satisfy code requirements and meet the unique needs of any project.

	Distributed Low-Voltage Power System	WaveLinX	LumaWatt Pro
Space type	Interior	Interior/Outdoor	Any
Stand-alone or Network	Stand-alone	Both	Network
Need-based feature progression			
Basic compliance only	●	●	●
Occupancy sensing	●	●	●
Daylight harvesting	●	●	●
Zone control	●	●	●
Scheduling	●	●	●
0-10V dimming	●	●	●
Individual fixture control	●	●	●
<b>Retrofit+Building Integration</b>	●	●	●
Total wireless connectivity		●	●
A/V integration		●	●
BMS integration		●	●
UI options (touchscreen, apps, etc.)		●	●
<b>Enterprise level building integration</b>		●	●
Facility management & tools		●	●
Floor plan & reporting tools			●
<b>Value-added services</b>			●
Asset tracking			●
API integration		●	●
Analytics/higher problem solving			●



Connected Systems  
[CLICK HERE](#)

**Metalux**

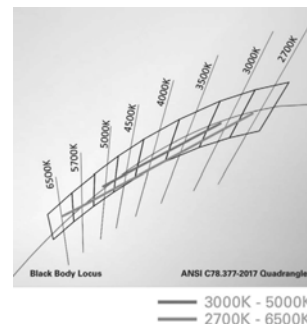
**22CZ2 LED**

**TYPE L6**

**VividTune™**  
color tuning solutions

## 22 Cruze ST LED with VividTune Tunable White

VividTune tunable white luminaires from Eaton deliver high-quality light in a broad range of continuously variable color temperatures and intensities. Create a dynamic environment by adjusting the ambient light warmer or cooler to influence mood, support the task at hand, or create a dramatic ambience. The ability to control correlated color temperature and intensity separately using simple controls is the next evolution of LED lighting for the commercial, educational, healthcare and hospitality space. The unparalleled flexibility and number of available lighting environments enable users to find the right light with tunable white.



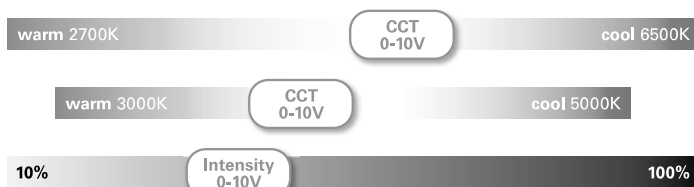
## Performance Data\*

Tunable White - Lumen Adjustment Factors				
CCT	3000K-5000K		2700K-6500K	
	80 CRI	90 CRI	80 CRI	90 CRI
2700K	-	-	0.868	0.741
3000K	0.894	0.736	0.893	0.771
3500K	0.946	0.804	0.924	0.809
4000K	0.993	0.868	0.944	0.835
4500K	1.002	0.883	0.961	0.857
5000K	1.002	0.883	0.974	0.874
6500K	-	-	0.988	0.897

2' x 2' Cruze ST LED - Example of Approximate Lumen Calculation			
	Standard Catalog #	VividTune 80 CRI Catalog #	VividTune 90 CRI Catalog #
CCT Setting	22CZ2-34HE-UNV-L835-CD1-U	22CZ2-34HE-UNV-L83050-W2A1-U	22CZ2-34HE-UNV-L93050-W2A1-U
3000K	-	3026	2491
3500K	3386	3202	2722
4000K	-	3362	2940
4500K	-	3394	2991
5000K	-	3394	2991

## Controlling VividTune Tunable White

VividTune luminaires make tunable white more accessible by using simple and familiar controls. From wall dimmers to wireless controls, VividTune tunable white luminaires are compatible with industry standard 0-10V dimming controls. A single 0-10V dimming input is used to control intensity (brightness) while a second 0-10V dimming input is used to adjust CCT. For suggested control configurations, go to [www.eaton.com/lighting](http://www.eaton.com/lighting) for tunable white application guides.



## Example of Lumen Adjustment Calculation

22CZ2-34HE-UNV-L83050-W2A1-U  
at 80 CRI tuned to 3500K

Adjusted Lumen =  
published lm x adjusted lm factor

Adjusted Lumen = 3386 x 0.946

Adjusted Lumen = 3202 lm

\* Lumen adjustment factors are for reference  
and may be different for each product selected.  
Refer to IES files for actual performance data on each.



Cooper Lighting Solutions  
1121 Highway 74 South  
Peachtree City, GA 30269  
P: 770-485-4800  
[www.eaton.com/lighting](http://www.eaton.com/lighting)

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Specifications and dimensions  
subject to change without notice.

PS519305EN page 6  
December 2, 2019 9:33 AM

TYPE L7

Lightology

## Photon Chandelier

ITEM NUMBER

TLG1155407

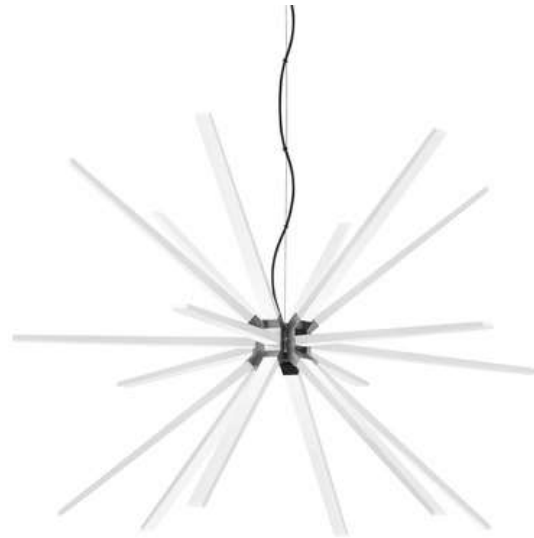


BRAND

Tech Lighting

### DESCRIPTION

Featuring a starburst of solid acrylic arms lit by integrated LED lights, the Photon Chandelier shines as a dramatic, modern centerpiece for your living room, dining area, or entryway. Dimmable with a TRIAC or ELV dimmer.



Shown in: Aged Brass / Clear

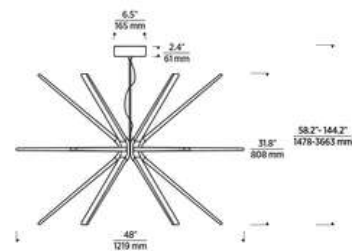
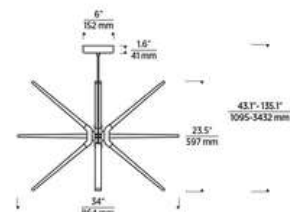
DIMMING SHALL BE COORDINATED WITH NEW LIGHTING CONTROLS IN SPACE.

SHADE COLOR	Clear
BODY FINISH	Aged Brass
WATTAGE	34.9W
DIMMER	Low Voltage Electronic
DIMENSIONS	48"W x 31.8"H
LED MODULE INCLUDED	
LAMP	18 x LED/1.94W/120V LED

### Technical Information

LUMINOUS FLUX	2656 lumens
LUMENS/WATT	1,369.07
LAMP COLOR	3000 K
COLOR RENDERING	90 CRI

ITEM NUMBER TLG1155407



COMPANY	PROJECT	FIXTURE TYPE	APPROVED BY	DATE

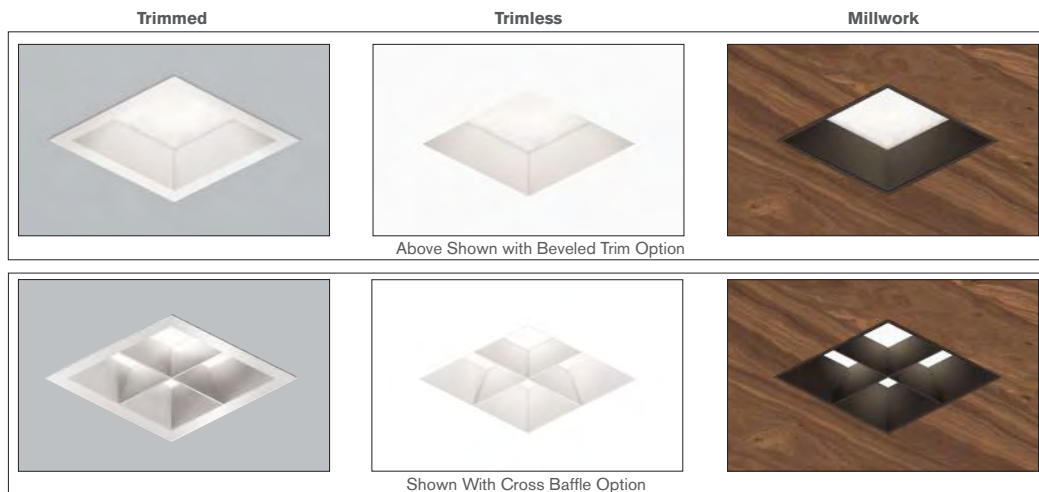
LIGHTOLOGY.COM | QUOTES@LIGHTOLOGY.COM

Dec 12, 2022 | 1.866.954.4489

## BeveLED® 2.2 Basic 4.5" Square Downlight - B4SD-G1

TYPE L8  
ALTERNATE MANUFACTURERS:  
VISUAL COMFORT "ELEMENT 4" PRO" SERIES  
3G "DL40SF" SERIES  
HE WILLIAMS "4DS" SERIES

### Universal and Field Convertible - Trim | Trimless | Millwork



[usailighting.com/beveled](https://usailighting.com/beveled)

Meet the new and improved BeveLED Basic, upgraded with even more efficient, perfectly consistent classic white LED light engines and our field convertible trims that allow for easy on-site changes from trimmed to trimless to millwork – all in a budget-conscious product with the same below ceiling appearance as our extremely versatile BeveLED 2.2 product line.

#### FEATURES

- Field Flexibility between trimmed, trimless and millwork
- Dry/damp/wet location rated for bathrooms and showers, including trimless and millwork
- 1% dimming standard + more dimming options
- Clear overspray protector for installation convenience
- Iconic beveled look with optional cross-baffle trim for glare control

#### COMPANION FAMILY PRODUCTS



Adjustable - B4SA-G1  
[usailighting.com/B4SA-G1](https://usailighting.com/B4SA-G1)

Wall Wash - B4SW-G1  
[usailighting.com/B4SW-G1](https://usailighting.com/B4SW-G1)

#### DOWNLIGHT PERFORMANCE DATA

		Classic White							
DELIVERED* PERFORMANCE:		9W		12W		16W		24W	
Color Rendering Index:		80+	90+	80+	90+	80+	90+	80+	90+
Source Lumens:		900	725	1275	1050	1775	1450	2650	2175
BeveLED Performance	Lumens Per Watt:	84	69	90	74	89	74	94	77
	Delivered Lumens:	750	625	1075	875	1500	1225	2250	1850
	EM Mode Output:	575 Delivered Lumens (nominal)							
Cross Baffle Performance	Lumens Per Watt:	80	65	85	70	85	70	90	73
	Delivered Lumens:	725	575	1025	850	1425	1175	2150	1775
	EM Mode Output:	550 Delivered Lumens (nominal)							

\*Based on 3000K. Performance varies for each specific beamspread and color temperature. See IES files for exact values at [usailighting.com](https://usailighting.com).

#### CORRELATED COLOR TEMPERATURE MULTIPLIER

		Classic White							
		2700K		3000K		3500K		4000K	
Color Rendering Index:		80+	90+	80+	90+	80+	90+	80+	90+
Multiplier for Lumen Output:		0.94	0.82	1.00	0.82	1.00	.88	1.00	0.94

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Revised 10/10/2022

Page 1

HOW TO SPECIFY

# BeveLED® 2.2 Basic

## 4.5" Square Downlight - B4SD-G1

Specify fixture part number. (All boxes must be filled in to correctly order)

B4SD	BeveLED Trim Style	Optional Trim Choice*	Wattage Options	LED Color Options	Beam Options	Lens Options	Bevel Trim Finish Options	*Flange/Millwork Collar Finish	Natatorium Corrosion Protection (optional)	Housing Options	Voltage Options <i>Select one</i>	Dimming/Driver Options	Accessories (Optional)*
	<b>F</b> Trimmed with Flange (use with all materials)	<b>XB</b> Cross-Baffle Trim	<b>Classic White Light</b>			<b>S</b> Solite (provided standard)	<b>WH</b> White	<b>WH</b> White	<b>NT (3)</b> Natatorium triple-coat Corrosion resistant (available with "F" flanged trims and painted finishes only)	<b>NCSM</b> New Construction Narrow Width	<b>UNV</b> 120V-277V	<b>For use with Universal Voltage 120V - 277V</b>	<b>CB27</b> 27" C-Channel Bars
	<b>L</b> Trimless Spackle-in (use with sheetrock and plaster only) (2)	"Leave blank for standard beveled downlight trim"	<b>09G1</b> 9W LED	<b>27KS</b> 2700K, 80+ CRI	<b>25</b> 25° beam	<b>BF</b> Borosilicate Frosted	<b>SC</b> Conduit Silver	<b>SC</b> Conduit Silver		<b>NC</b> New Construction		<b>No Additional Charge</b>	<b>D6E</b> EldoLED 0-10V, 1% (provided standard)
	<b>M</b> Millwork Knife-Edge (use with wood and stone) (2)		<b>12G1</b> 12W LED	<b>27KH</b> 2700K, 90+ CRI	<b>50</b> 50° beam		<b>GR</b> Grey	<b>GR</b> Grey		<b>NCCP</b> Chicago Plenum			<b>CB52</b> 52" C-Channel Bars
			<b>16G1</b> 16W LED	<b>30KS</b> 3000K, 80+ CRI	<b>90</b> 90° beam		<b>BL</b> Black	<b>BL</b> Black		<b>NCIC</b> Insulation Contact Rated / Airtight			<b>EM</b> Emergency Battery (4)
			<b>24G1</b> 24W LED	<b>30KH</b> 3000K, 90+ CRI			<b>BZ</b> Bronze	<b>BZ</b> Bronze					<b>D4H</b> Lutron H ECO, 1% Fade (1)
				<b>35KS</b> 3500K, 80+ CRI			<b>PR (2, 3)</b> Primer Finish	<b>PR</b> Primer Finish					<b>D6A</b> EldoLED 0-10V, 0.1%
				<b>35KH</b> 3500K, 90+ CRI			<b>AC (2, 3)</b> Clear Matte Anodized	<b>AC</b> Clear Matte Anodized					<b>D6B</b> EldoLED 0-10V, 0.1%
				<b>40KS</b> 4000K, 80+ CRI			<b>WH</b> White	<b>WH</b> White					<b>D7</b> EldoLED DALI, 0.1%
				<b>40KH</b> 4000K, 90+ CRI			<b>GR</b> Grey	<b>GR</b> Grey					<b>D28</b> EldoLED DMX, 0.1%
							<b>BL</b> Black	<b>BL</b> Black					<b>For use with 120V only</b>
							<b>AB (2, 3)</b> Piano Gloss Black	<b>AB</b> Piano Gloss Black					<b>No Additional Charge</b>
							<b>WH</b> White	<b>WH</b> White					<b>D19</b> Phase 2-wire, 1% (1)
							<b>GR</b> Grey	<b>GR</b> Grey					
							<b>BL</b> Black	<b>BL</b> Black					
							<b>RAL</b> Custom Color Specify RAL #	<b>RAL</b> Custom Color Specify RAL #					

Notes: 1 Not available with 9W.  
2 Not available with NT natatorium corrosion finish  
3 Not available with Cross Baffle (XB) trim  
4 For NC and NCSM housings only. NCSM housing requires above ceiling access.  
5 This is a gasketed remote test switch available with NCSM housings only. Above ceiling access required

### TRIM FINISH OPTIONS



Custom colors and primer finish also available

Page 2

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TYPE L8

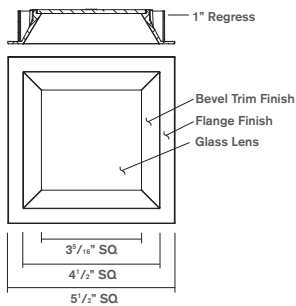
**USAI**  
Lighting

## BeveLED® 2.2 Basic 4.5" Square Downlight - B4SD-G1

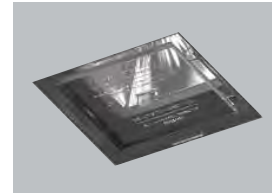
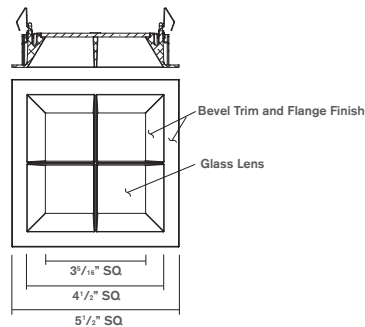
### Trimmed - B4SDF-G1

#### TRIM DETAILS

##### Standard Bevel Trimmed B4SDF



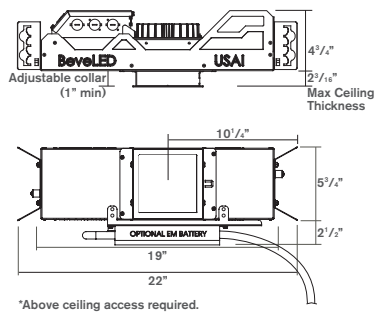
##### Cross Baffle Trimmed B4SDF-XB



Clear acrylic overspray protector provided standard with every housing to keep out dust and contaminants during construction. Allows for use as work light.

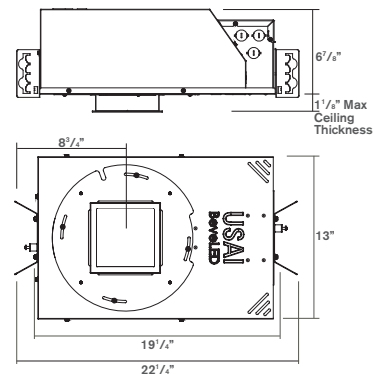
#### HOUSING OPTIONS

##### New Construction Narrow Width - NCSM NCSM with Emergency Battery\*



\*Above ceiling access required.

##### New Construction - NC Insulation-Contact Rated - NCIC Chicago Plenum Rated - NCCP NC with Emergency Battery



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## BeveLED® 2.2 Basic 4.5" Square Downlight - B4SD-G1

### BEVELED BASIC SPECIFICATIONS

#### FIELD REPLACEABLE LED LIGHT ENGINE

is serviceable through the aperture without tools or with a Philips screwdriver. All USAI Lighting light engines feature industry-leading color consistency.

#### TRIM

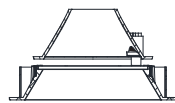
BeveLED Basic B4SD is available with two trim choices: our standard beveled downlight trim is a die-cast 4.5" x 4.5" aperture square with a 1" regress retaining a glass lens. The optional cross baffle trim (-XB-) available for additional glare control is cast with a square integral cross baffle painted in a finish matching the bevel trim finish choice. The cross baffle is available in standard painted finishes only; primer, natatorium, and anodized finishes are not available.

#### FIELD REPLACEABLE DRIVER

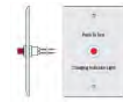
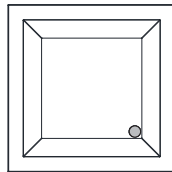
Unless otherwise specified, a 0-10V, 100%-1% solid state electronic constant current integral D6E dimming driver with a high power factor is provided standard and sources 2mA. All integral dimming drivers are located within the fixture housing and are serviceable from below the ceiling through the aperture. Some on-time delay may be experienced depending on control system used. All dimming drivers comply with IEEE C62.41 surge protection.

#### EMERGENCY BATTERY

IOTA emergency battery provides backup power for 90 minutes. NC EM fixtures are provided with an integral emergency battery with integral test switch and can be serviced through the aperture from below the ceiling plane. NCSM EM fixtures are provided with an integral emergency battery with a remote test switch, which comes with a 24" lead length for location of the test switch. Remote EM test switch is dry/damp only; select EMW emergency option for a wet location-rated EM test switch. NCSM EM fixtures require above ceiling access for service of the EM pack. Fixtures that have no USAI EM option may be connected to an inverter (by others) for emergency lighting.



Integral Emergency  
Test Switch included  
with NC housing



Remote Emergency Test Switch  
included with NCSM housing;  
above ceiling access required.

#### HOUSING

All BeveLED Basic fixtures are field-flexible which allows for field changes from trimless or millwork to trimmed with a simple components change with parts from USAI All-Ways Square® (covered by US Pat. No: US 7,832,889) housing allows alignment of square aperture (up to 20° rotation) after housing installation and prior to finish ceiling installation. Housings are fabricated of 20 ga. steel construction with thru wire J-box, 4 in 4 out at min. 90°C, #12 AWG thru branch circuit wiring, except for NCSM which is fabricated of 18 ga. steel. NCIC housing for use with 9W, 12W, and 16W light engines only is rated for direct contact with spray foam insulation of R-42 or less.

#### MOUNTING

B4SDF overlap flange fixtures are designed for use in sheetrock, acoustical ceiling tile, and many other ceiling materials. B4SDL trimless fixtures are provided with a spackle collar and are designed for use in sheetrock/mud-in ceiling applications. B4SDM millwork fixtures are provided with a millwork collar in finish to match trim finish specified and are designed for use in wood/millwork, stone and tile construction applications. Butterfly brackets and residential grade adjustable nailer bars extendible from 14" to 24" centers with integral nails are provided standard for attachment to building structure. C-channel bars are optionally available for acoustical ceiling applications.

#### FIXTURE WEIGHT

NC, NCIC, and NCCP housings weigh 16 lbs. NCSM housing weighs 10 lbs., NCSM with EM weighs 16.5 lbs, and NC housing with EM weighs 24.5 lbs.

#### WARRANTY

Based on IESNA LM80-2008, BeveLED has a 50,000 hour rated life at 70% lumen maintenance (L70). USAI Lighting Warranty covers replacement parts for 5 years from date of shipment. Ambient temperatures at fixture location should not exceed 40°C during normal operation.

#### CEILING CUT OUT

B4SDF Trimmed with Overlap Flange: 5-1/16" x 5-1/16"

B4SDL Trimless Spackle-in: 5-1/2" x 5-1/2"

B4SDM Millwork Knife-edge: 4-15/16" x 4-15/16"





## BeveLED® 2.2 Basic 4.5" Square Downlight - B4SD-G1

### BEVELED BASIC SPECIFICATIONS

#### TRIM FINISH

BeveLED Basic trims are available in a wide range of finishes. USAI's standard powdercoat painted trim finishes are white, conduit silver, gray, black, and bronze. A clear matte anodized bevel and piano gloss black electrocoated bevel are also available with matching or contrast-painted flange finish options. Natatorium finishes are triple-coated for corrosion resistance; these coatings are offered in painted finishes only and are not available for trimless or millwork. All trim finishes are dry/damp/wet location rated, with the exception of the anodized (-AC-) and electrocoated (-AB-) bevel finishes, which are dry/damp only. Please contact the USAI factory with a RAL number specification for custom color trims, or specify the field-paintable primer finish option. Cross baffle trim option is painted to match the bevel finish selected and is not available with Primer, natatorium, AC, or AB finishes.

#### LISTINGS

Dry/Damp/Wet location. AC and AB trim finishes are dry/damp only. Remote EM test switch is dry/damp only. Select EMW option for wet location remote test switch. UL2043 rated for use in air handling plenums. NRTL/CSA-US tested to UL standards. IBEW union made. All USAI Lighting products are Buy American Act (BAA) compliant.



#### NOTES

- Use of pressure washer voids warranty

#### PHOTOMETRICS

Consult factory or website for IES files. Tested in accordance with IESNA LM79.

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Revised 10/10/2022



Project: \_\_\_\_\_  
Fixture Type: \_\_\_\_\_  
Location: \_\_\_\_\_  
Contact/Phone: \_\_\_\_\_

## JUNO SURFACE MOUNT

FOR JUNCTION BOX INSTALLATION  
5", 7", 11", 13" ROUND



TYPE L9  
ALTERNATE MANUFACTURERS:  
HALO "SLD6" SERIES  
PRESCOLITE "LBSES-RD" SERIES  
DMF "DRD5S" SERIES

JSF SERIES

### PRODUCT DESCRIPTION

Sleek, ultra-low profile energy efficient LED surface mount downlights in multiple sizes from 5" to 13" • Provides economical installation by mounting directly over standard and fire-rated junction boxes • Optional finish trims available for custom, designer look similar to standard recessed downlights • Provides general illumination in residential and commercial applications including multi-family and hospitality • Ideal for use in corridors, living spaces, closets, hallways, pantries, stairways, outdoor covered areas with Emergency Option and much more.

### PRODUCT SPECIFICATIONS

**Construction** Shallow, less than 1", solid ring with white finish  
• Non conductive fixture for shower light applications • Optional, field installable finish trims available for 5" and 7" versions to change the exterior finish of fixture

**Optics** Light guide technology combined with diffusing lens conceals the LEDs from direct view and provides uniform lens luminance.

**LED Light Engine** LEDs mounted directly to heatsink designed to provide superior thermal management and ensure long life • 2700K, 3000K, 3500K or 4000K LED color temperature • LEDs binned for 4-step MacAdam ellipse color consistency • 90 CRI minimum.

**LED Driver** Choice of dedicated 120 volt (120) driver or universal voltage (MVOLT) driver that accommodates input voltages from 120-277 volts AC at 50/60Hz • Power factor > 0.9 at 120V input • 120 volt driver is dimmable with the use of most incandescent, magnetic low voltage and electronic low voltage wall box dimmers • Universal voltage driver is dimmable with the use of most 0-10V wall box dimmers • External driver is only available on 5" and 7" models • For a list of compatible dimmers, see [JUNOSLIMFORM-DIM](#).

**Emergency Battery Option** Available on fixture sizes 11" and larger • Battery factory assembled to fixture with integral test switch • Drives LEDs for 90 minutes to meet Life Safety Code (NFPA-LSC), National Electrical Code (NEC), and UL requirements • Title 20 certified battery pack available when ordering E10WLCP option • EBX option provides back box without battery for consistent look when used in same space as fixtures with EL emergency option • Damp location only with emergency option.

**Life** Rated for 50,000 hours at >70% lumen maintenance.

**Labels** ENERGY STAR® certified • Certified to the high efficacy requirements of California T24 JA8-2016 • CSA listed for US and Canada • Suitable for wet locations (covered ceilings) • Damp location only with emergency option.

**Testing** All reports are based on published industry procedures; actual performance may differ as a result of the end-user environment and applications. All values are design or typical values, measured under laboratory conditions at 25 °C.

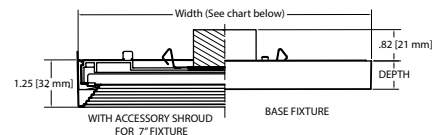
**Warranty** 5-year limited warranty. This is the only warranty provided and no other statements in this specification sheet create any warranty of any kind. All other express and implied warranties are disclaimed. Complete warranty terms located at: [www.acuitybrands.com/support/warranty/terms-and-conditions](http://www.acuitybrands.com/support/warranty/terms-and-conditions)

**Note:** Actual performance may differ as a result of end-user environment and application.

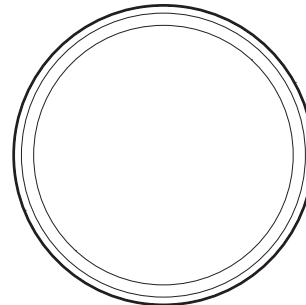
All values are design or typical values, measured under laboratory conditions at 25 °C.

Specifications subject to change without notice.

### DIMENSIONS



External driver available on 5" and 7" models only.



### ROUND SPECIFICATIONS

	Width	Depth
JSF 5IN	5.25 (13.34)	0.75 (1.91)
JSF 7IN	7.77 (19.74)	0.75 (1.91)
JSF 11IN	11.08 (28.14)	0.9 (2.29)
JSF 13IN	13.05 (33.15)	0.9 (2.29)

All dimensions are in inches (centimeters) unless otherwise indicated.

### INSTALLATION

**Junction Box Mounting** Fixture provided with leads for direct wire connection in j-box • Installs directly to industry standard junction boxes • Compatible boxes include 4" metal or plastic octagonal standard and fire-rated junction boxes (3 1/2" junction box screw-hole spacing required for installation) • Minimum 2 1/8" deep junction box required for 5" and 7" fixtures (no depth requirement for 11" and larger fixtures) • Quick mount bracket provides fast installation of fully assembled fixture to junction box • Suitable for ceiling mount • Suitable for use within closet storage spaces when installed per NEC requirements.

**Junction box sizes vary - Verify compatibility with fixture prior to installation**



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1 of 3

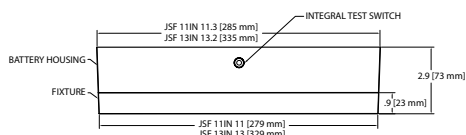
G1.8.3.4

TYPE L9

# JUNO SLIMFORM™ LED SURFACE MOUNT DOWNLIGHTS

FOR J-BOX INSTALLATION  
5", 7", 11", 13" ROUND  
**JSF SERIES**

## EMERGENCY BATTERY FOR 11" AND 13"



## PERFORMANCE DATA

	JSF 5IN		JSF 7IN		JSF 11IN		JSF 13IN	
	120V	MVOLT	120V	MVOLT	120V	MVOLT	120V	MVOLT
Lumens	700	700	1000	1000	1300	1300	1800	1800
CRI	90CRI		90CRI		90CRI		90CRI	
CCT	27K, 30K, 35K, 40K		27K, 30K, 35K, 40K		27K, 30K, 35K, 40K		27K, 30K, 35K, 40K	
Voltage	120V	120V-277V	120V	120V-277V	120V	120V-277V	120V	120V-277V
Input Power	10W	10W	13W	13W	15W	15W	20W	20W
Input Current	110mA	50mA	150mA	60mA	180mA	80mA	240mA	110mA
Frequency	50/60Hz		50/60Hz		50/60Hz		50/60Hz	
Power Factor	>0.9		>0.9		>0.9		>0.9	

## ORDERING INFORMATION

Example: JSF 5IN 07LM 27K 90CRI 120 FRPC WH

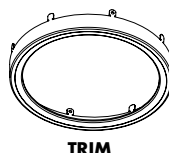
Series	Size/Lumens	Color Temperature	CRI	Voltage/Driver	Finish	Emergency Battery <sup>1,2</sup>	
JSF SlimForm Surface Mount Downlight - Round	5IN 07LM 5", 700 Lumens	27K 2700K	90CRI 90+ CRI	120 FRPC Dedicated 120V, Forward Reverse Phase Dimming	WH White	EL <sup>3</sup> Battery Back-up Option EBX Empty Back Box for Aesthetics	
	7IN 10LM 7", 1000 Lumens	30K 3000K					
	11IN 13LM 11", 1300 Lumens	35K 3500K		MVOLT ZT Universal Voltage 120V-277V, 0-10V Dimming		E10WLC <sup>4</sup> EM Self-Diagnostic battery pack, 10W Constant Power, Certified in CA Title 20 MAEDBS.	
	13IN 18LM 13", 1800 Lumens	40K 4000K					

<sup>1</sup>: EL Battery Back-up option is not Energy Star certified

## ACCESSORIES

**TRIM** – Optional, field installable finish trim rings available to change the exterior finish of fixture.  
Example: JSFTRIM 5IN BZ

Series	Size	Finish
JSFTRIM SlimForm Accessory-Trim	5IN 5 inches	BL Black
	7IN 7 inches	BZ Bronze
		SN Satin Nickel



Notes:

- Emergency battery available with 11IN and 13IN only.
- Emergency battery is only available with MVOLT ZT.
- EL battery option not available in California due to Title 20 restrictions.
- E10WLCP ordering option is Title 20 certified for shipments to California.



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G1.8.34

TYPE L9

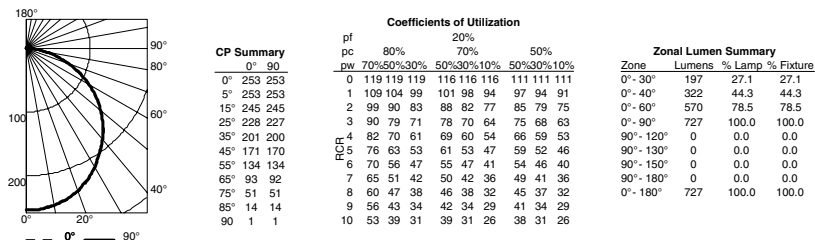
**JUNO SLIMFORM™ LED  
SURFACE MOUNT DOWNLIGHTS**

FOR J-BOX INSTALLATION

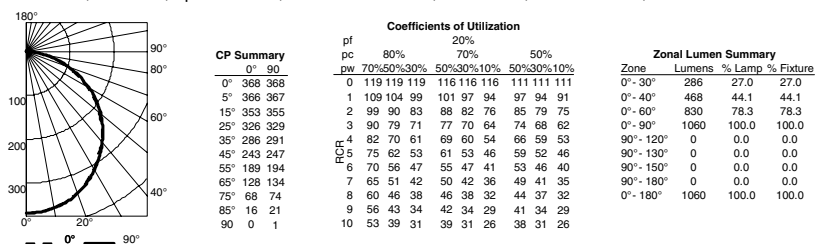
5", 7", 11", 13" ROUND

**JSF SERIES****PHOTOMETRICS****Distribution Curve****Distribution Data****Coefficient of Utilization****Illuminance Data at 30" Above Floor for  
a Single Luminaire**

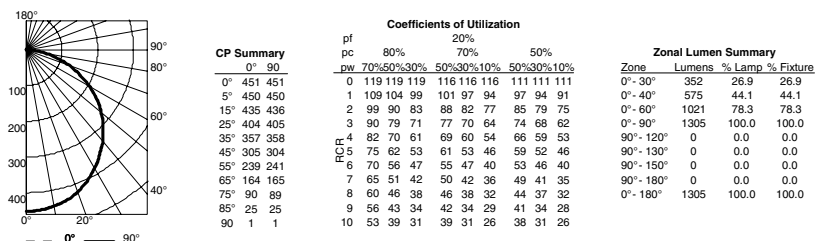
JSF 5IN 27K, 2700K LEDs, input watts: 9.72, delivered lumens: 727, LM/W = 74.8, test no. ISF 33599, tested in accordance to IESNA LM-79.



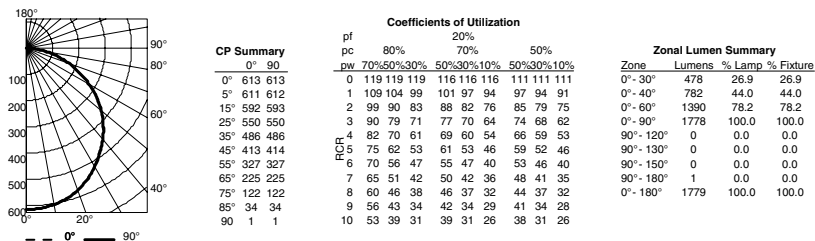
JSF 7IN 27K, 2700K LEDs, input watts: 12.8, delivered lumens: 1060, LM/W = 82.8, test no. ISF 33600, tested in accordance to IESNA LM-79.



JSF 11IN 27K, 2700K LEDs, input watts: 15.2, delivered lumens: 1305, LM/W = 85.9, test no. ISF 33661, tested in accordance to IESNA LM-79.



JSF 13IN 27K, 2700K LEDs, input watts: 20.2, delivered lumens: 1779, LM/W = 88, test no. ISF 33663, tested in accordance to IESNA LM-79.



For 30K fixtures, use 1.02 multiplier; For 35K fixtures, use 1.03 multiplier, For 40K fixtures, use 1.07 multiplier.

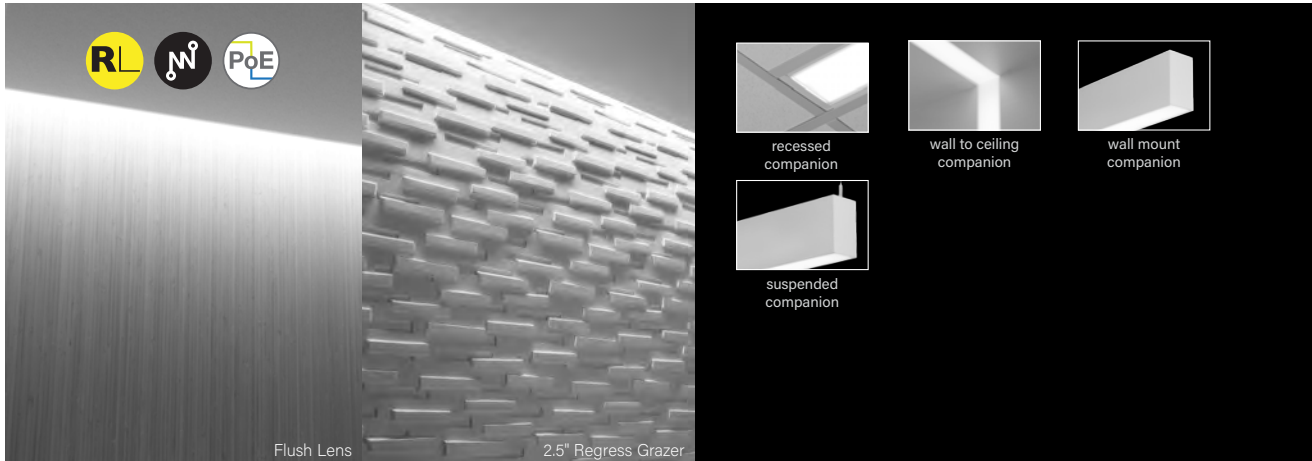
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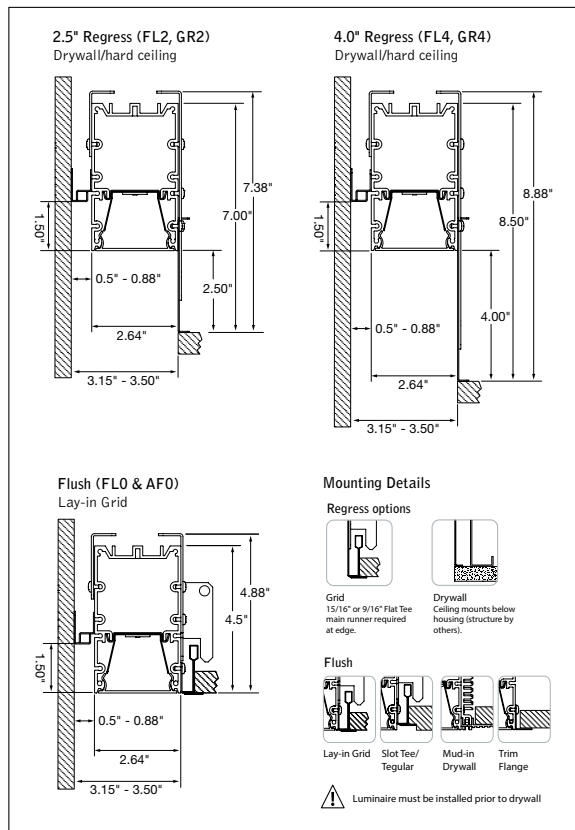
# Seem® 2

LED PERIMETER

TYPE L10  
ALTERNATE MANUFACTURERS:  
PRUDENTIAL "BIONICPRO2" SERIES  
FORUM "ALUMINA" SERIES  
LUXILLUMINAIRE "EOS 2.0" SERIES



## DIMENSIONAL DATA



## FEATURES

Seem 2 LED perimeter provides a glowing transition between ceiling and wall with flush, 2.5° regress or 4.0° regress lenses.

Adjustable housing option provides flexibility with +/- 3 inch adjustability for wall-to-wall illumination.

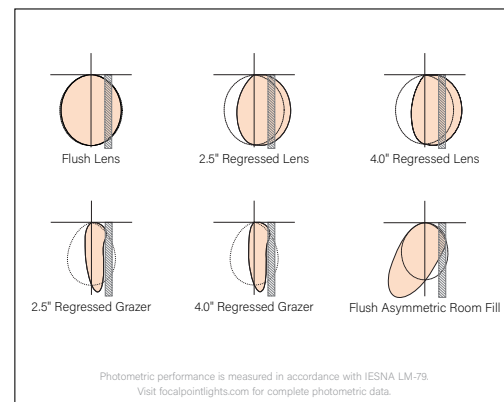
Grazer optic provides even vertical illumination and adds drama to a space by highlighting textured walls and architectural details.

Asymmetric Room Fill optic provides superior efficacy and uniformity to light rooms and corridors from the perimeter.

Connected Solutions: Integrates with wired and wireless building lighting control systems.

PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires.

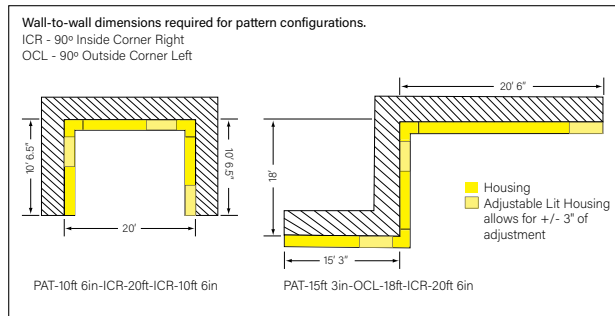
## DISTRIBUTIONS



fixture:

project:

## PATTERN CONFIGURATIONS



## SPECIFICATIONS

## LED System

Proprietary linear LED module incorporates premium LEDs on a robust platform to achieve excellent thermal management. LEDs are placed to promote a uniform appearance. Available in 2700K, 3000K, 3500K or 4000K with CRI>80 or CRI>90, 3 SDCM. 3500K and 4000K with CRI>90 have a cyanosis observation index (COI) of 3.3 or less. LED modules and drivers are replaceable from below.

## Construction

One piece extruded aluminum housing. 20 Ga. steel end caps, bulkheads, sliding sleeve and regress leg. 4' unit weight: 17 lbs.

## Optic

Reflectors fabricated of 22 Ga. steel finished in High Reflectance White powder coat. Extruded acrylic lens .07" thick with satin finish, up to 8' continuous.

## Electrical

Luminaires are pre-wired with factory installed branch circuit wiring and over-molded quick connects. Standard 120-277V constant current driver includes 0-10V analog dimming. Power factor > .9. PoE compatible: Integrates with Power over Ethernet lighting systems via standard, low-voltage wires. PoE runs require an independent PoE node and power feed for each luminaire section.

## Emergency Battery

Output - 10 watts for 90 minutes. Maximum mounting height: 179ft. Emergency Circuit with Connected Solutions (DLM1, LMFS1, LMFS2, NLT1, ENL1, CLM1, NXE1, WLPX) shipped standard with leads to connect UL924 compliant device, by others.

## Labels

UL and cUL Listed. Suitable for Dry or Damp Locations, indoor use only.

## Finish

Polyester powder coat applied over a multi-stage pre-treatment.

## Lumen Maintenance

Reported: L70 at >61,000 hours      Calculated: L70 at 270,000 hours  
L90 at >61,000 hours      L90 at 73,000 hours  
(Derived from EPA TM-21 calculator. Based on typical conditions, consult factory for additional data.)

## Reliability

At Focal Point, our products are designed to stand the test of time. Each luminaire is engineered using superior components, manufactured with the utmost care and rigorously tested. Contact us for reliability data.

## Warranty

LED system rated for operation in ambient environments up to 25°C. 5-year limited warranty.

## 4' PERFORMANCE CHART

See page 3.

**QS 10 DAY** Options in orange qualify for the Quickship program. 1000' total. Refer to Quickship Guide for complete details.

Focal Point LLC reserves the right to change specifications for product improvement without notification.

TYPE L10

## ORDERING

Luminaire Series

Seem 2 LED Perimeter

FSM2PR

## Housing Type

Adjustable Lit Housing  
(Allows for +/- 3" adjustment to overall run length.  
3' minimum luminaire length.)

ALH

Fixed Housing  
(not recommended for wall to wall installations)

FXH

Shielding  
(Not available with Unit Sliding Sleeves - SSB)

FL0

2.5" Regress

FL2

4" Regress

FL4

2.5" Regress Grazer

GR2

4.0" Regress Grazer

GR4

Flush Asymmetric Room Fill  
(Not available with Unit Sliding Sleeves - SSB)

AF0

## Lumen Output

125 Lumens per foot  
(1 D1 L1 & D1 only 4' minimum)

125LF

250 Lumens per foot  
(Not available with LHI. 4' minimum with D1)

250LF

375 Lumens per foot  
(4' minimum with LHI & D1)

375LF

625 Lumens per foot  
(3' minimum with LHI)

625LF

## Color Temperature

2700K, 80+ CRI or 90+ CRI

27K or 927K

3000K, 80+ CRI or 90+ CRI

30K or 930K

3500K, 80+ CRI or 90+ CRI

35K or 935K

4000K, 80+ CRI or 90+ CRI

40K or 940K

## Circuits &amp; Zones

1 Circuit, non-emergency

1C

Consult Ordering Guide on page 5 for multiple  
circuiting and zoning options

\_C\_Z\_DL

## Voltage

120/277 UNV Volt

UNV

Low Voltage

LV

## Control System &amp; Dimming Level

0-10V - 10% Dimming

LD1

0-10V - 1% Dimming

LD1

Low Voltage, PoE compatible  
(No driver. Not available with EM or EC. LV Voltage only)

LVN

Lutron Hi-Lume EcoSystem (LDE1) - 1% Dimming

LH1

Wattstopper DLM - 1% Dimming

DLM1

Wattstopper Fixture Sensor\*  
(Remote mounted sensor. See sensor layout guide)

LMFS1

Low Density - 1% Dimming  
(Remote mounted sensor. See sensor layout guide)

LMFSD

High Density - 1% Dimming  
(Remote mounted sensor. See sensor layout guide)

NLT1

Acuity nLight - 1% Dimming\*  
(Not available with CP)

ENL1

Enlight Smart Sensor - 1% Dimming\*  
(Remote mounted sensor. See sensor layout guide)

CLM1

Enclum CLM Connected Lighting Module - 1% Dimming

NXE1

Current NX Enabled - 1% Dimming\*  
(Not available with CP)

WLPX

WaveLinux Pro - 1% Dimming\*  
(Remote mounted sensor. See sensor layout guide)

\* (3' minimum length. 7' minimum length with FXH & EM. G & ST mounting only)

## Mounting

Lay-in Grid

G

Flush  
(FL0 & AF0)

Slot Tee / Tegular

ST

Trim Flange Drywall

TF

Mud-in Trimless Drywall

XFF

Regressed  
(FL2, FL4,  
GR2 & GR4)

Grid

G

Trimless Drywall

XF

## Factory Options

(See Ordering Guide for ordering details for DC, EC, EM & ECD)

Chicago Plenum

CP

(Not available with Flex Whip)

Daylight Circuit

\_DC

Emergency Circuit

\_EC

Emergency Battery Pack†

\_EM

Emergency Control Device†

\_ECD

6' New York City Flex Whip (120V)

FNY1

6' New York City Flex Whip (277V)

FNY2

6' Flex Whip

FW

Unit Sliding Sleeves

SSB

(Set of two unit 12" sleeves. Fixed housing in straight runs only.  
FL2, FL4, GR2 & GR4 only. 3' minimum luminaire length.)

## Finish

Matte White Housing

WH

Luminaire Length

\_ft \_in

Specify luminaire/row length in 1" increments  
(2' minimum length)

## Pattern Options

Specify patterns based on wall-to-wall dimensions  
(See Pattern Configurations for example)

PAT

Example: FSM2LPR-ALH-FL2-625LF-35K-1C-120-LD1-G-WH-PAT-10-ICR-20-ICR-10

† 4' minimum length with EM or ECD. 120/277 Volt only. EM or ECD not available at corners.

TYPE L10

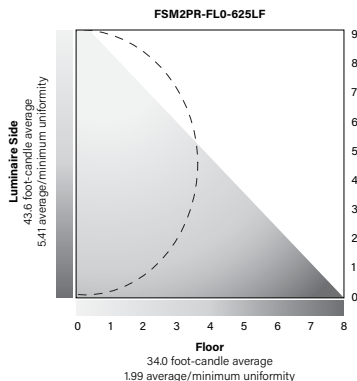
#### 4' PERFORMANCE CHART

Lumens per Foot	Lumen Output	Tested System Watts	LPW					
			FL0	FL2	FL4	GR2	GR4	AF0
125LF	500	6	69	64	62	80	79	84
250LF	1000	12	85	78	76	98	97	103
375LF	1500	18	89	82	80	103	102	108
625LF	2500	31	86	79	78	100	99	105

Based on 3500K, 80 CRI, 4' lengths. Lumen multipliers: Lumen output may vary +/- 5%. Actual wattage may vary +/- 5%.

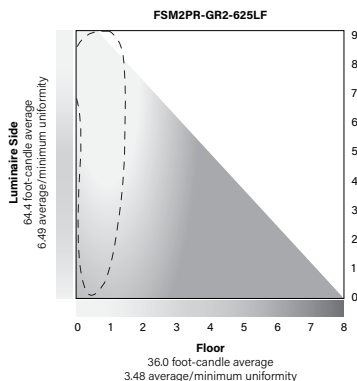
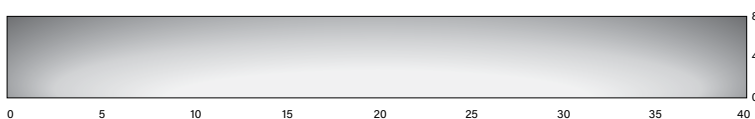
#### SELECTING THE BEST OPTIC FOR EACH APPLICATION

8' W x 40' L x 9' H Corridor | 80/50/20 Reflectances | 0.9 Light Loss Factor



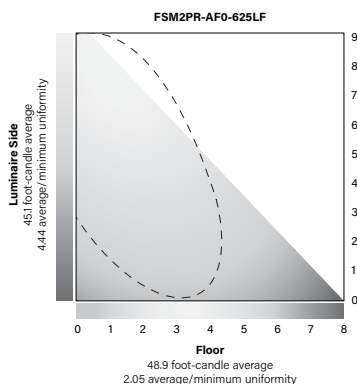
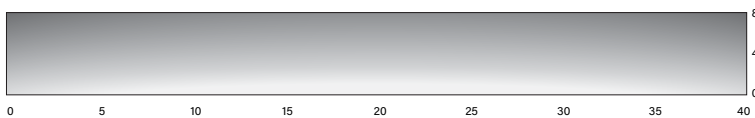
##### Standard Lens

The standard optic results in a Lambertian light distribution that provides uniform illumination. It is ideal to create a glowing transition between the walls and ceiling, adding dimension to the space.



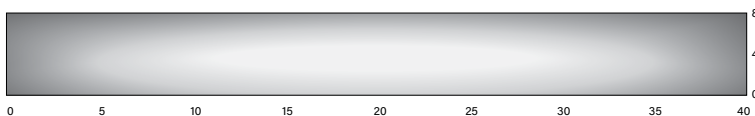
##### Grazer Lens

The grazer optic closely grazes walls, highlighting textures and architectural details. It is intended to provide even illumination and deliver maximum visual impact on the vertical surfaces.



##### Asymmetric Room Fill Lens

The asymmetric room fill optic projects light into the space to evenly illuminate horizontal planes. It is ideal to light rooms and corridors from the perimeter, resulting in superior efficacy and uniformity on the floor.



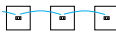




















TYPE L10



# Seem® 2 Perimeter LED

Focal Point provides flexibility in meeting the needs of each project by integrating with several building lighting control systems. A variety of sensors, drivers and other components can be specified that allow the luminaires to communicate with wired and wireless networks. All zoning can be digitally reconfigured through the application software. Daylight harvesting, occupancy sensing, integration with HVAC systems, and individual controls enable the monitoring and modulating of light levels and temperature in order to save energy, reduce costs and maximize occupants' comfort. All Connected Solutions luminaires require a compatible building control system.\*

Connected Solution		Ordering Code	Model #**	Protocol	Compatible Networks*	Occupancy & Daylight	Temperature Reporting	Communication to Luminaire	Drivers
  WATTSTOPPER®		DLM1	LMFC-011	DLM	DLM	Enabled	No	Wired 	<b>Advance by Signify</b> , Optotronic by eldoLED
		LMFS1	LMFS-601 & LMFI-111	DLM Wireless	DLM	Enabled	No	Wireless	<b>Advance by Signify</b>
		LMFSD	LMFS-601						<b>Optotronic by eldoLED (Dexal)</b>
 Lighting Solutions		WLXP	OEM-WAA	WaveLinX Wireless	WaveLinX Pro Trellix	Enabled	No	Wireless (WaveLinX Pro Wireless Area Controller)	<b>Advance by Signify</b>
  Connections located under access panel.		D11	Specified Driver	DALI	Crestron Züm Wireless & SpaceBuilder	Enabled	No	Wired	<b>eldoLED ECOdrive</b>
		L11		0-10V					<b>Advance by Signify</b>
		CLM1	ZBHA-CLM-DIM-ENC	ZigBee	Encelium X Light Management System	Enabled	No	Wireless	<b>Optotronic by eldoLED</b> Advance by Signify
		ENL1	SU-5E-IOT	Enlighted RF	Enlighted	Integrated	Yes	Wireless	<b>Advance by Signify</b>
  Connections located under access panel.		LH1	LDE1	EcoSystem	Quantum, Energi Savr Node, Energi TriPak	Enabled	No	Wired	<b>Lutron Hi-Lume</b>
  Connections located under access panel.		NLT1	nEPS-60-IO	nLight	nLight	Enabled	No	Wired 	<b>eldoLED ECOdrive</b> , eldoLED SOLOdrive
  NXE1 adds 0.78" to overall height.		NXE1	NXFM-LV	NX	NX Distributed Intelligence	Enabled	No	Wired 	<b>Optotronic by eldoLED</b>

\*Not all compatible networks may be listed. \*\*For performance data and additional control system details please visit the connected solutions manufacturer websites. Primary drivers are listed in **bold**. To specify a particular driver please consult factory.  
†Controls systems supplied by others.



# Ordering Guide

**Direct Only Linear Circuitry, Zones & Factory Options****HOW TO USE THIS GUIDE**

Fill out the worksheet on the following page to specify your requirements for circuitry, zones, and factory options.

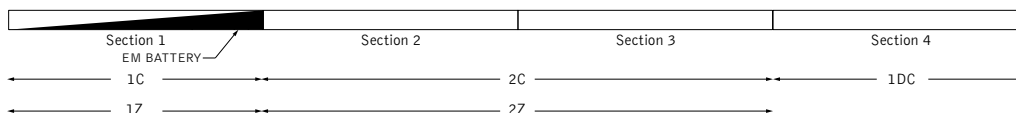
Refer to the run chart for standard run configurations, consult factory for custom configurations.

Complete the Totals / Ordering Codes at the bottom of the worksheet and add to your ordering logic on the cut sheet.

Submit the worksheet along with your order.

EXAMPLE	TOTAL RUN LENGTH: 32ft		JOB NAME:			FIXTURE TYPE:			
	HOUSING SECTION	SECTION LENGTH	SHARED ELECTRICAL FEED, NORMAL POWER			FACTORY OPTIONS			
						SEPARATE ELECTRICAL FEEDS			EM
			SWITCHING CIRCUIT	DIMMING ZONE	DAYLIGHT ZONE	DAYLIGHT CIRCUIT	EMERGENCY CIRCUIT	ECD	
	1	8	1C	1Z				1EM	
	2	8	2C	2Z					
	3	8	2C	2Z					
4	8				1DC				
Totals / Ordering Codes		2C	2Z		1DC			1EM	

ORDERING: FSM4L-FL-625LF-35K- 2C2Z -UNV-LD1-G2- 1DC-1EM -WH-32ft



KEY	
<b>C = Switching Circuit</b> Switched Hot / Shared Neutral	<b>DC = Daylight Circuit</b> Switched Hot / Separate Neutral
<b>Z = Dimming Zone</b> Dimming Control Wires	<b>EC = Emergency Circuit</b> Switched Hot / Separate Neutral
<b>DL = Daylight Zone</b> Daylight Dimming Control Wires	<b>EM = Emergency Battery</b> Unswitched Hot / Shared Neutral
	<b>ECD = Emergency Control Device</b> Unswitched Hot / Separate Neutral

**DEFAULTS**

- Zones and Factory Options illuminate entire sections from 4' to 8' in length.
- One shared or isolated circuit and zone required per housing section.
- Limit of one EM or ECD per housing section.
- Additional electrical feed required for applications greater than three shared circuits and zones.
- Each DC, EC and ECD require an additional electrical feed.
- ECD not available in the same housing section as EC.
- Longer lead times and additional pricing may apply for custom run configurations.

**CUSTOM LENGTHS**

- If partial illumination of emergency or daylight section is required, indicate in ordering guide and add "partial illumination" in Order Notes. Drawing required.
- Engineering validation required, longer lead times may apply.

# Ordering Guide Worksheet

Linear Circuitry, Zones & Factory Options



TOTAL RUN LENGTH: _____		JOB NAME: _____			FIXTURE TYPE: _____			
HOUSING SECTION	SECTION LENGTH	SHARED ELECTRICAL FEED, NORMAL POWER			FACTORY OPTIONS			EM
		SWITCHING CIRCUIT	DIMMING ZONE	DAYLIGHT ZONE	DAYLIGHT CIRCUIT	EMERGENCY CIRCUIT	ECD	
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Totals / Ordering Codes		_C	_Z	_DL	_DC	_EC	_ECD	_EM

Combine to create Circuits & Zones ordering code      Enter as individual Factory Options

## RUN CHART

Run length (ft)	Housing Configuration Section Lengths	Run length (ft)	Housing Configuration Section Lengths	Run length (ft)	Housing Configuration Section Lengths	Run length (ft)	Housing Configuration Section Lengths
9	5 + 4	21	8 + 8 + 5	33	8 + 8 + 8 + 5 + 4	45	8 + 8 + 8 + 8 + 8 + 5
10	6 + 4	22	8 + 8 + 6	34	8 + 8 + 8 + 6 + 4	46	8 + 8 + 8 + 8 + 8 + 6
11	7 + 4	23	8 + 8 + 7	35	8 + 8 + 8 + 7 + 4	47	8 + 8 + 8 + 8 + 8 + 7
12	8 + 4	24	8 + 8 + 8	36	8 + 8 + 8 + 8 + 4	48	8 + 8 + 8 + 8 + 8 + 8
13	8 + 5	25	8 + 8 + 5 + 4	37	8 + 8 + 8 + 8 + 5		
14	8 + 6	26	8 + 8 + 6 + 4	38	8 + 8 + 8 + 8 + 6		
15	8 + 7	27	8 + 8 + 7 + 4	39	8 + 8 + 8 + 8 + 7		
16	8 + 8	28	8 + 8 + 8 + 4	40	8 + 8 + 8 + 8 + 8		
17	8 + 5 + 4	29	8 + 8 + 8 + 5	41	8 + 8 + 8 + 8 + 5 + 4		
18	8 + 6 + 4	30	8 + 8 + 8 + 6	42	8 + 8 + 8 + 8 + 6 + 4		
19	8 + 7 + 4	31	8 + 8 + 8 + 7	43	8 + 8 + 8 + 8 + 7 + 4		
20	8 + 8 + 4	32	8 + 8 + 8 + 8	44	8 + 8 + 8 + 8 + 8 + 4		

Standard run configurations, consult factory for custom configurations.

## Kendo RS Recessed linear illumination system

TYPE L11  
ALTERNATE MANUFACTURERS:  
QTRAN "EMBD" SERIES  
ACCLAIM "FLEX 120" SERIES  
APPROVED EQUAL

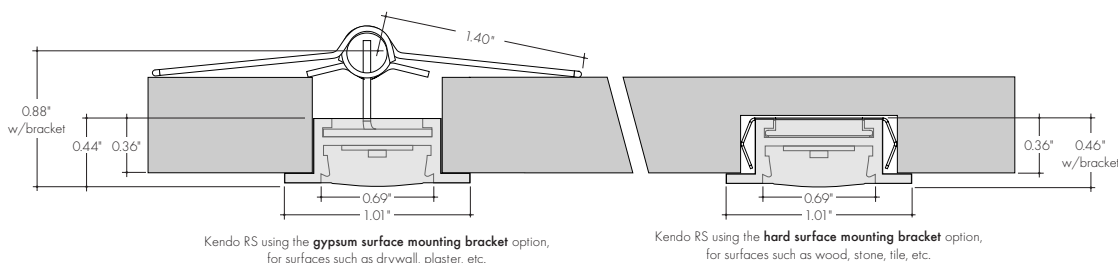


### Features

- 24VDC Class 2 fixtures made to order up to 144". Fixtures can be linked up to 35' depending on output
- Suitable for undercabinet, millwork ground recessed, and ceiling recessed applications
- Approved for closet/storage space installation per NEC 410.16(A)(3) and 410.16(C)(5)
- Dot free even illumination achievable in SOHD & VHO with frosted lens
- Vibrant colors with R9 values up to 98
- Single micro binned LEDs +/- 30 CCT
- Dims with minimal color shift
- Class 2 listed for damp locations
- Proprietary strong bond solder method handles up to 50lbs of torque on wire leads and connectors
- 5 Year warranty
- Finish Options
  - Silver anodized
  - Black powder coated
  - Bronze powder coated
  - White powder coated



### Profile dimensions



### Technical information

OUTPUT OPTIONS	SO (LL36)	SOHD (LL72-LO)	HO (LL54)	VHO (LL72)
Lumens at 3000K	234 lm/ft	273 lm/ft	369 lm/ft	487 lm/ft
Average power consumption at 4'	3.2 W/ft	4.0 W/ft	5.2 W/ft	6.5 W/ft
Lumens / Watt (with clear lens)	74 lm/W	76 lm/W	78 lm/W	77 lm/W
Maximum system length (in series)	35'	24'	26'	18'

CCT INFO / LUMEN MULTIPLIER		TM-30-15		
Color Temperature	Multiplier (reference - 3000K)	CRI	R <sub>f</sub>	R <sub>g</sub>
1900K	0.63	96	94	97
2200K	0.68	96	95	101
2400K	0.72	98	97	101
2700K	0.76	97	96	101
2900K	0.82	98	96	102
3000K	1.00	97	95	104
3500K	1.05	97	94	105
4100K	1.37	97	90	99

### Ordering code

MODEL	LENGTH	CCT	OUTPUT	LENS	MOUNTING	FINISH	POWER FEED POSITION / TYPE
KRS	12	19K	SO	C	HS	SA	B
KRS - Kendo RS	12" - 144" 4" increments	19K - 1900K 22K - 2200K 24K - 2400K 27K - 2700K 29K - 2900K 30K - 3000K 35K - 3500K 41K - 4100K	SO - Standard SOHD - Standard High Density HO - High VHO - Very High	C - Clear HF - Half Frosted F - Frosted FF - Flat Frosted M - Medium	HS - Hard surface mounting bracket GS - Gypsum surface mounting bracket NB - No bracket	SA - Silver BK - Black BZ - Bronze WH - White (BK, BZ, WH finishes will have wire longer)	B - Back 1 - 72" wire leads 1X2 - 72" wire leads at both ends 2 - 72" wire leads at one end and quick connect at other 3 - Single quick connect 4 - Dual quick connect

REV9.5 0421202

REFER TO LIGHTING DRAWINGS

FIXTURE TO MOUNT IN CABINETS. PROVIDE ALL REQUIRED DRIVERS, MOUNTING HARDWARE, ETC. AS REQUIRED TO FULLY ILLUMINATE UNDER SHELF.

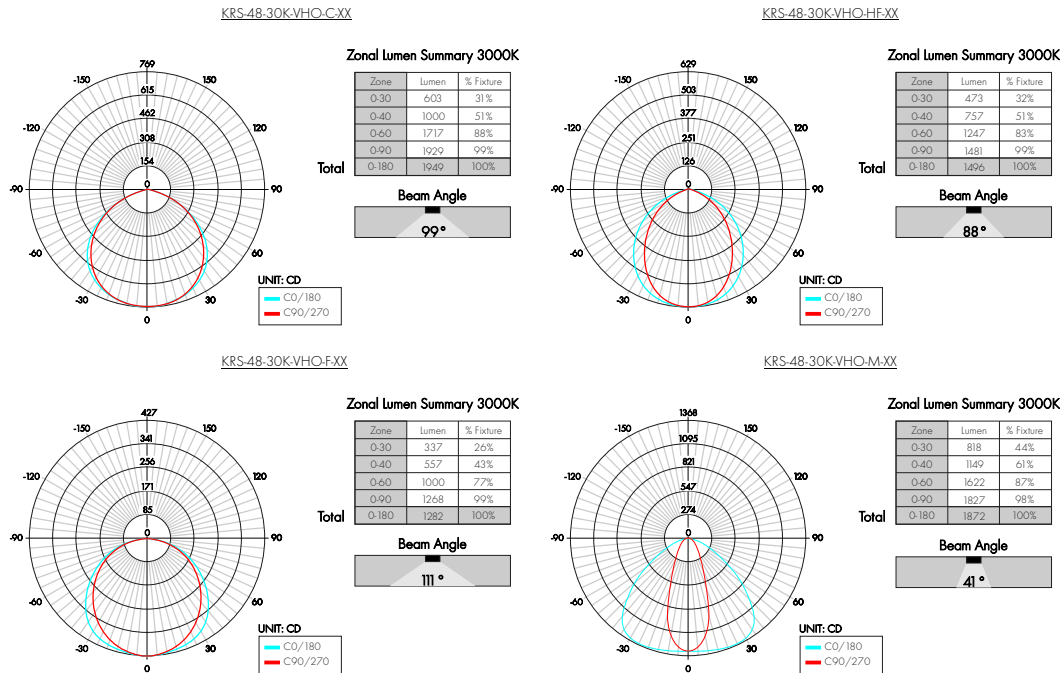
www.luminii.com tel: 224-333-6033

TYPE L11

# Kendo RS | Recessed linear illumination system



## Photometry



## Light Transmission

Lens/Accessory	Percentage Light Transmission
clear lens	100%
medium	96%
half-frosted lens	77%
frosted lens	66%

## LED Dotting per extrusion

Output	Lens				
	Clear	Half-Frosted	Flat Frosted	Frosted	Medium
SO (LL36)	CD	CD	CD	CD	CD
SOHD (LL72-LO)	CD	CD	SD	ND	CD
HO (LL54)	CD	CD	CD	SD	CD
VHO (LL72)	CD	CD	SD	ND	CD

CD = Clear Dotting  
SD = Slight Dotting  
ND = No Dotting



Clear Dotting   Slight Dotting   NO Dotting

TYPE L11

Kendo RS Recessed linear illumination system

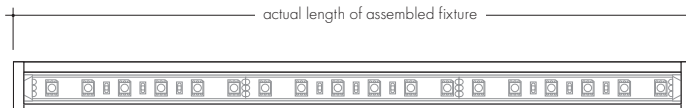


Power consumption per fixture length

Based on operation with PSD series of power supplies.

Nominal Length	Actual Length	SO		Actual Length	SOHD		Actual Length	HO		Actual Length	VHO	
		W/ft	Total wattage		W/ft	Total wattage		W/ft	Total wattage		W/ft	Total wattage
12"	13-2/16"	3.25	3.25	13-1/16"	4.20	4.20	13-1/16"	5.35	5.30	13-1/16"	6.75	6.75
16"	17 "	3.25	4.00	16-15/16"	4.23	5.66	17 "	5.33	7.06	16-15/16"	6.75	9.00
20"	21 "	3.25	5.25	20-15/16"	4.27	7.12	21 "	5.31	8.82	20-15/16"	6.75	11.25
24"	24-14/16"	3.25	6.50	24-14/16"	4.30	8.60	24-15/16"	5.30	10.60	24-14/16"	6.75	13.50
28"	28-13/16"	3.25	7.75	28-13/16"	4.20	9.77	28-13/16"	5.28	12.33	28-13/16"	6.75	16.75
32"	32-13/16"	3.25	8.50	32-12/16"	4.10	10.94	32-13/16"	5.26	14.06	32-12/16"	6.75	19.00
36"	36-11/16"	3.25	9.75	36-11/16"	4.00	12.10	36-12/16"	5.25	15.80	36-11/16"	6.65	19.95
40"	40-10/16"	3.25	10.25	41-10/16"	4.00	13.43	40-11/16"	5.23	17.40	41-10/16"	6.65	22.20
44"	44-10/16"	3.20	11.75	45-9/16"	4.00	14.76	44-10/16"	5.21	19.00	45-9/16"	6.65	24.40
48"	48-9/16"	3.20	12.80	49-8/16"	4.00	16.10	48-9/16"	5.20	20.60	49-8/16"	6.55	26.20
52"	52-8/16"	3.20	13.30	53-7/16"	3.97	17.27	53-13/16"	5.18	22.40	53-7/16"	6.55	28.50
56"	56-7/16"	3.20	14.80	57-6/16"	3.95	18.44	57-12/16"	5.16	24.20	57-6/16"	6.55	30.50
60"	60-6/16"	3.20	16.00	61-5/16"	3.92	19.60	61-11/16"	5.15	26.00	61-5/16"	6.45	32.25
64"	64-5/16"	3.20	17.00	65-4/16"	3.89	20.73	65-10/16"	5.13	27.60	65-4/16"	6.45	34.40
68"	70-3/16"	3.15	18.00	69-3/16"	3.86	21.86	69-9/16"	5.11	29.20	69-3/16"	6.45	36.55
72"	74-2/16"	3.15	18.90	73-2/16"	3.83	23.00	73-8/16"	5.10	30.80	73-2/16"	6.40	38.40
76"	78-1/16"	3.15	19.00	77-1/16"	3.80	24.06	77-7/16"	5.08	32.40	77-1/16"	6.40	40.50
80"	82-1/16"	3.15	21.50	81 "	3.83	25.12	81-7/16"	5.06	34.00	81 "	6.40	43.00
84"	85-15/16"	3.15	22.05	84-15/16"	3.74	26.20	85-6/16"	5.05	35.70	84-15/16"	6.25	43.75
88"	89-14/16"	3.15	23.00	88-14/16"	3.73	27.33	89-4/16"	5.03	37.10	88-14/16"	6.25	46.00
92"	93-13/16"	3.10	24.00	92-13/16"	3.71	28.46	93-3/16"	5.01	38.50	92-13/16"	6.25	48.00
96"	97-12/16"	3.10	24.80	97-12/16"	3.70	29.60	97-3/16"	5.00	40.00	97-12/16"	6.15	49.20
100"	101-12/16"	3.10	26.30	101-11/16"	3.67	30.56	101-2/16"	4.98	41.60	101-11/16"	6.15	51.25
104"	105-10/16"	3.05	27.10	105-9/16"	3.64	31.53	105-1/16"	4.96	43.20	105-9/16"	6.15	53.00
108"	109-10/16"	3.05	28.00	109-9/16"	3.61	32.50	109 "	4.95	44.80	109-9/16"	6.00	54.00
112"	113-9/16"	3.05	28.50	113-8/16"	3.59	33.46	112-15/16"	4.93	46.20	113-8/16"	6.00	56.00
116"	117-7/16"	3.05	30.00	117-7/16"	3.56	34.43	116-14/16"	4.91	47.60	117-7/16"	6.00	58.00
120"	121-7/16"	3.00	30.50	121-6/16"	3.54	35.40	120-14/16"	4.90	48.90	121-6/16"	5.90	59.00
124"	125-6/16"	3.00	31.50	125-5/16"	3.52	36.36	124-13/16"	4.88	50.40	125-5/16"	5.90	60.60
128"	129-4/16"	3.00	32.50	129-4/16"	3.50	37.33	128-12/16"	4.86	51.90	129-4/16"	5.90	62.20
132"	133-4/16"	2.95	33.50	133-3/16"	3.48	38.30	132-11/16"	4.85	53.30	133-3/16"	5.80	63.80
136"	137-3/16"	2.95	34.30	137-2/16"	3.46	39.20	136-10/16"	4.83	54.70	137-2/16"	5.80	65.30
140"	141-2/16"	2.95	35.20	141-1/16"	3.44	40.10	140-9/16"	4.81	56.10	141-1/16"	5.80	66.80
144"	145-1/16"	2.90	36.00	145 "	3.42	41.00	145-13/16"	4.80	57.40	145 "	5.70	68.40

to calculate cutout  
for recess opening  
subtract 0.25" from  
actual fixture length

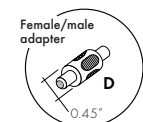
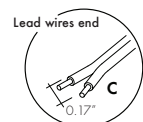
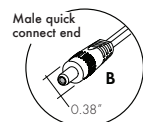
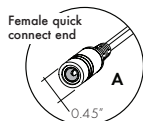


TYPE L11

# Kendo RS | Recessed linear illumination system



## Connectors & Accessories

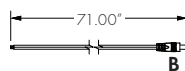


### Linking and extension cable options

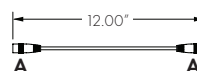
Male quick-connect  
Part # LMC



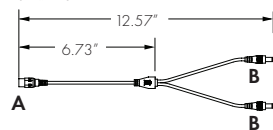
Male quick-connect long  
Part # LMC-70



12" extension cable  
Part # EC-12



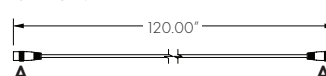
Y-splitter  
Part # LYC



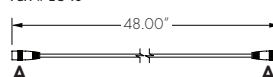
Female/male adaptor  
Part # FMA



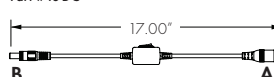
120" extension cable  
Part # EC-120



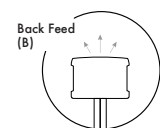
48" extension cable  
Part # EC-48



Inline DC switch  
Part # IS-DC



### Powerfeed Position / Type



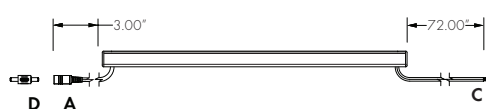
72" wire leads  
(1)



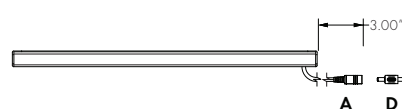
72" wire leads at both end  
(1X2)



72" wire leads at one end and quick connect at other  
(2)



Single quick connect  
(3)



Dual quick connect  
(4)



3, and 4 powerfeed options require #LMC to connect to PSD series of power supplies.

TYPE L11

Kendo RS | Recessed linear illumination system

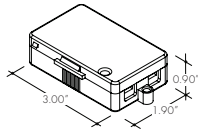


### Accessory options

Splice Box

LVSP-4T-BK

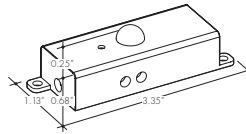
Low voltage, 4 terminal splice box, black



### PIR Infrared Occupancy Sensor

OS-DC-F4-BK

OS-DC-F4-BK - Occupancy Sensor

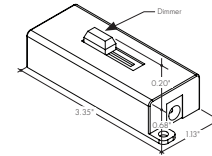


Note: a Male quick connector for input and output is required.

## 24VDC Low Voltage In-Line Dimmer Module

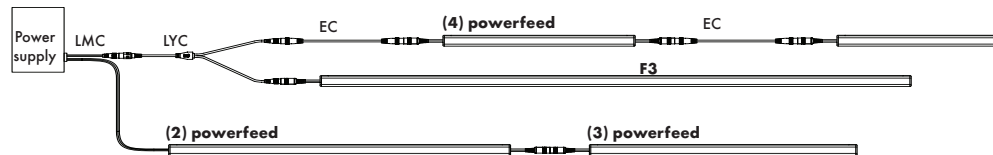
DIM-DC-F4-BK

**DIM-DC-F4-BK** - 24VDC Low Voltage In-Line Dimmer Module



Note: a Male quick connector for input and output is required.

### Sample layout



TYPE L11

## Kendo RS | Recessed linear illumination system



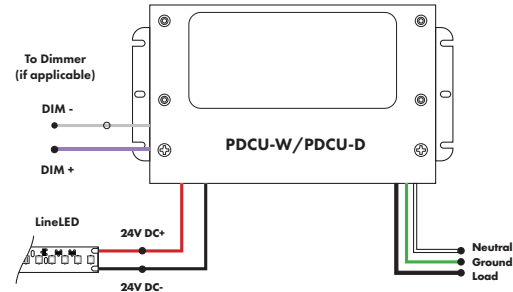
### Power Supply

See fixture and power supply instructions & spec sheet for wiring information. Dimming possible in select models - view Luminii website for list of compatible dimmers.

#### Universal Power Supply

MODEL	POWER	OUTPUT
<b>PDCU-W</b>	<b>96</b>	<b>24</b>
PDCU-W - IP66 Wet Series	96 - 96 W 3X96 - 3X96 W	24 - 24 VDC
PDCU-D - IP20 Dry Series	30 - 30 W 60 - 60 W 96 - 96 W 3X96 - 3X96 W	

0-10V - 1% dimming  
MLV/ELV/TRIAC - 1% dimming, consult dimming compatibility chart  
Compatibility:  
View a complete list of compatible dimmers on product page ([Link](#))

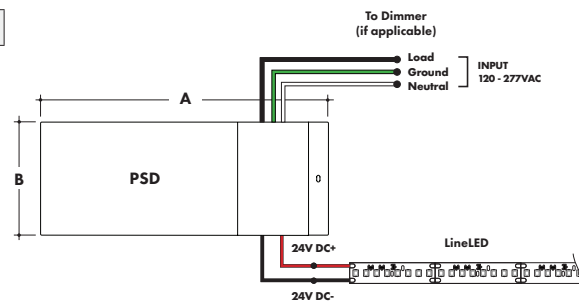


MODELS	PDCU-W 96W	PDCU-W 3X96W	PDCU-D 30W	PDCU-D 60W	PDCU-D 96W	PDCU-D 3X96W
<b>A Length</b>	8.66"	11.85"	6.10"	7.93"	8.25"	9.57"
<b>B Width</b>	3.73"	4.32"	3.35"	3.35"	4.10"	5.94"
<b>Depth</b>	1.61"	1.81"	1.33"	1.32"	1.56"	1.13"

#### Magnetic Low Voltage Dimming Power Supplies

MODEL	POWER	OUTPUT	INPUT
<b>PSD</b>	<b>48</b>	<b>24</b>	
PSD - PSD Series dims down to 0%	48 - 48 Watt 96 - 96 Watt 288 - 288 Watt (3 x 96Watt)	24 - 24 VDC	Blank - 120 V 240 - 240 V 277 - 277 V

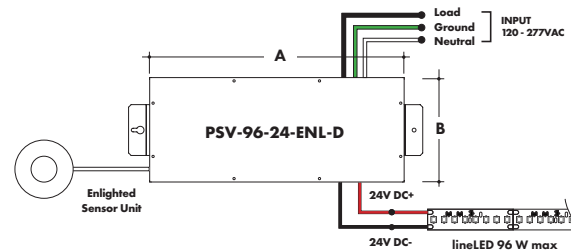
MODELS	48W	96W	288W
<b>A Length</b>	11.25"	11.25"	13.06"
<b>B Width</b>	3.42"	3.42"	8.42"
<b>Depth</b>	3.42"	3.27"	4.47"



#### Enlight Enabled Dimming Power Supplies:

MODEL	POWER	OUTPUT	DIMMING	LOCATION
<b>PSV</b>	<b>96</b>	<b>24</b>	<b>ENL</b>	<b>D</b>
PSV - PSV Series	96 - 96 Watt	24 - 24 VDC	ENL - Enlighted Dimming	D - Damp

MODELS	96W
<b>A Length</b>	14.40"
<b>B Width</b>	5.20"
<b>Depth</b>	2.60"





TYPE L11

## Kendo RS | Recessed linear illumination system



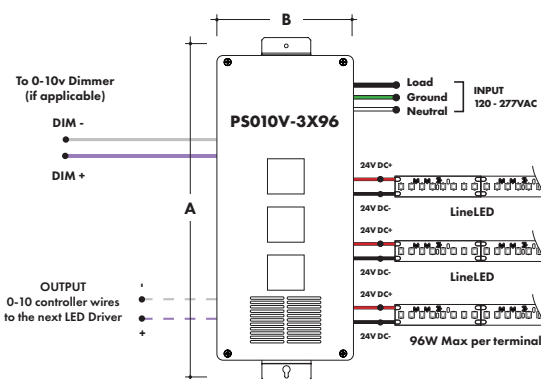
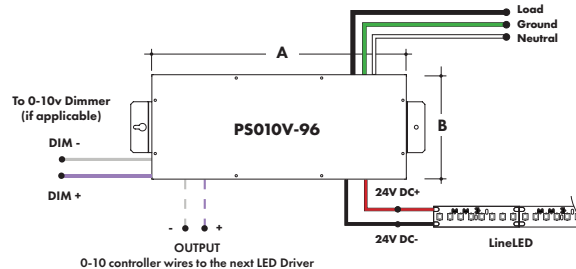
### Power Supply

See fixture and power supply instructions & spec sheet for wiring information. Dimming possible in select models - view Luminii website for list of compatible dimmers.

#### 0-10V Dimming Power Supplies

MODEL	POWER	OUTPUT	DIMMING
<b>PS010V</b>	<b>96</b>	<b>24</b>	<b>LIN</b>
PS010V - 0-10V Power Supply dims down to 0%			
	96 - 96 Watt 3X96 - 3 X 96 Watt	24 - 24 VDC	LIN - Linear LOG - Logarithmic

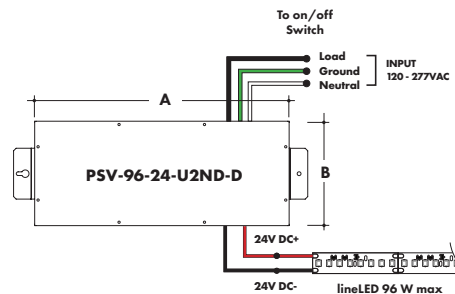
MODELS	96W	3X96
<b>A Length</b>	14.40"	15.75"
<b>B Width</b>	5.20"	6.62"
<b>Depth</b>	2.60"	4.95"



#### Non-Dimming Power Supply

MODEL	POWER	OUTPUT	DIMMING	LOCATION
<b>PSV</b>	<b>96</b>	<b>24</b>	<b>U2ND</b>	<b>D</b>
PSV - PSV Series 96 - 96 Watt 24 - 24 VDC U2ND - Non Dimming D - Damp				

MODELS	96W
<b>A Length</b>	14.40"
<b>B Width</b>	5.20"
<b>Depth</b>	2.60"



TYPE L11

## Kendo RS | Recessed linear illumination system



### Power Supply

See fixture and power supply instructions & spec sheet for wiring information. Dimming possible in select models - view Luminii website for list of compatible dimmers.

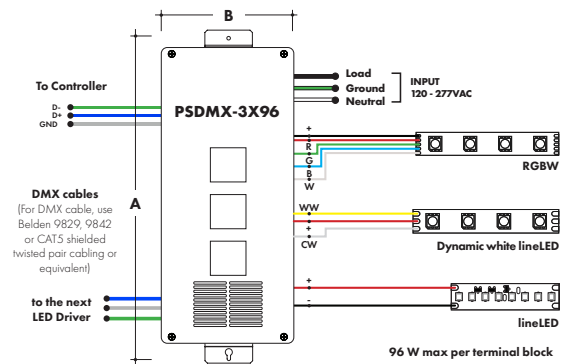
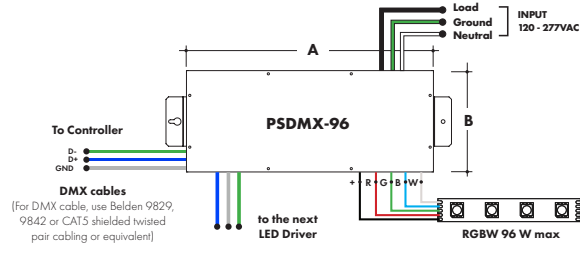
#### DMX Dimming Power Supplies

MODEL	POWER	OUTPUT
<b>PSDMX</b>	<b>96</b>	<b>24</b>

PSDMX - DMX Power Supply 96 - 96 Watt 24 - 24 VDC  
3X96 - 3 X 96 Watt

Features eldoLED's LINEARdrive configurable dimmable drivers

MODELS	96W	3X96
<b>A Length</b>	14.40"	15.75"
<b>B Width</b>	5.20"	6.62"
<b>Depth</b>	2.60"	4.95"



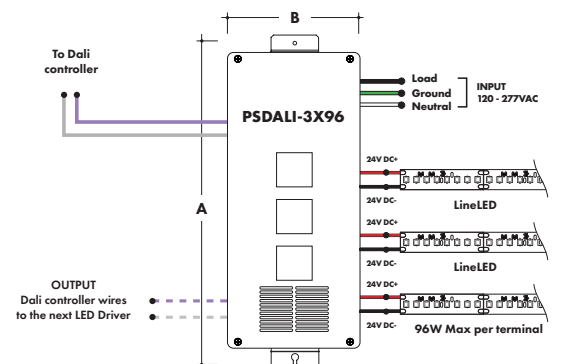
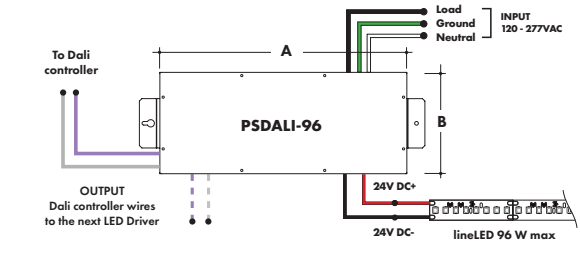
#### DALI Dimming Power Supplies

MODEL	POWER	OUTPUT
<b>PSDALI</b>	<b>96</b>	<b>24</b>

PSDALI - DALI Power Supply 96 - 96 Watt 24 - 24 VDC  
dims down to 0% 3X96 - 3 X 96 Watt

Features eldoLED's LINEARdrive configurable dimmable drivers

MODELS	96W	3X96
<b>A Length</b>	14.40"	15.75"
<b>B Width</b>	5.20"	6.62"
<b>Depth</b>	2.60"	4.95"



TYPE L11

## Kendo RS | Recessed linear illumination system



### Power Supply

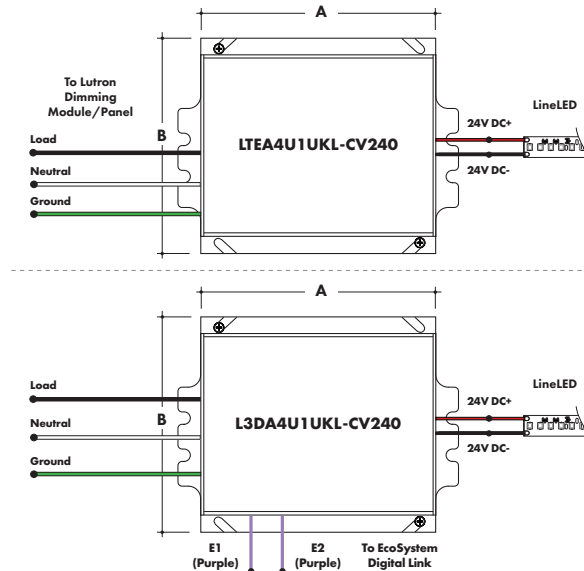
See fixture and power supply instructions & spec sheet for wiring information. Dimming possible in select models - view Luminii website for list of compatible dimmers.



Luminii is a Lutron OEM Advantage Partner

MODEL	MODEL
<b>LTEA4U1UKL-CV240</b>	<b>L3DA4U1UKL-CV240</b>
Lutron - HiLume™ 1% 2-wire LED Driver (120V forward phase only)	HiLume™ 1% EcoSystem Voltage LED driver

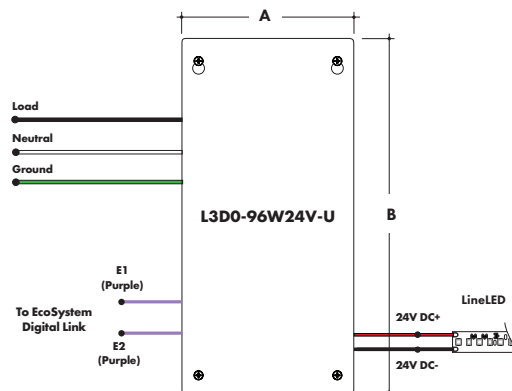
MODELS	LTEA4U1UKL-CV240	L3DA4U1UKL-CV240
<b>A Length</b>	4.89"	4.98"
<b>B Width</b>	4.00"	4.00"
<b>Depth</b>	2.62"	2.62"



Luminii is a Lutron OEM Advantage Partner

MODEL
<b>L3D0-96W24V-U</b>
HiLume™ 0.1% EcoSystem Voltage LED Driver with Soft-On, Fade-to-Black™

MODELS	L3D0
<b>A Length</b>	10.50"
<b>B Width</b>	5.50"
<b>Depth</b>	2.00"



TYPE L11

Kendo RS | Recessed linear illumination system



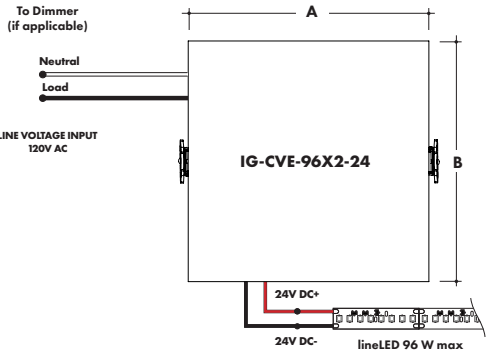
Power Supply

See fixture and power supply instructions & spec sheet for wiring information. Dimming possible in select models - view Luminii website for list of compatible dimmers.

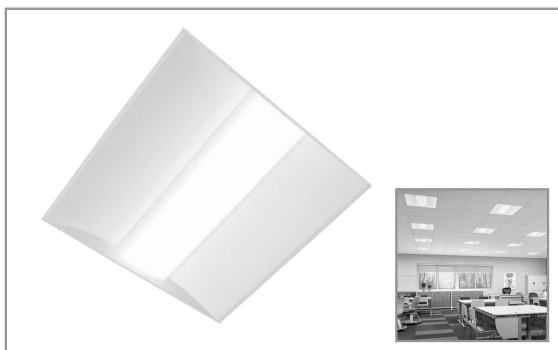
In ground, Electronic Low Voltage Dimming Power Supplies

MODEL	POWER	OUTPUT	INPUT
IG - In ground CVE Series	CVE - ELV Dimming DALI - eldoLED Dali dimming Both dims down to 0.1%	96X2 - 2 X 96 Watt 24 - 24 VDC	Blank - 120 V 277 - 240/277 V

MODELS	Dual Circuit
A Length	8.40"
B Width	8.30"
Depth	8.10"



Project		Catalog #		<b>TYPE L12</b> <b>ALTERNATE MANUFACTURERS:</b> <b>LITHONIA "2BLT2" SERIES</b> <b>COLUMBIA "LCAT22" SERIES</b> <b>HE WILLIAMS "PT LED" SERIES</b>
Prepared by		Notes		
				Date



## Metalux

### Cruze ST 22CZ2

2' x 2' LED Specification Grade Troffer

#### Typical Applications

Office • Education • Healthcare • Hospitality • Retail

#### Interactive Menu

- Order Information page 2
- Photometric Data page 3
- Connected Systems page 4
- VividTune™ Color Tuning Solutions page 5
- Product Warranty

#### Product Certification



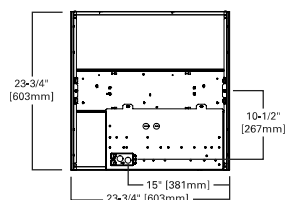
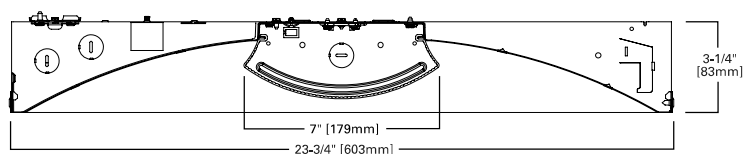
#### Product Features



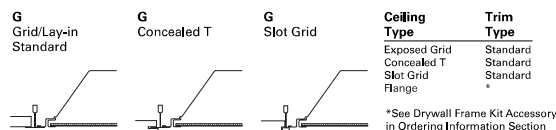
#### Top Product Features

- Latch-less design provides clean architectural look
- VividTune CCT tuning options from 3000K-5000K or 2700K-6500K
- Designers delight - ribbed, smooth and round perforated lens options
- High performance efficacy up to 138 lm/W
- Integrated sensor systems - occupancy, daylight and IoT connectivity

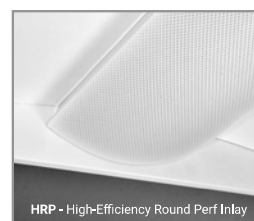
#### Dimensional and Mounting Details



#### Ceiling Compatibility



#### Shielding



See ordering information for more shielding options.

## Metalux

22CZ2 LED

TYPE L12

## Order Information

SAMPLE ORDER NUMBER: 22CZ2-34HE-UNV-L835-CD1-U

FOR EMERGENCY  
FIXTURES ONLY

Rating	Series	Lumen Output	Shielding	Voltage	Options	Emergency Options
Rating	Series	Lumen Output	Shielding	Voltage <sup>(2)</sup>	Options	Emergency Options
[Blank]=Standard ATW-SW4 Chicago Rated	22CZ2-2x2 Cruze ST	<b>High Efficacy</b> 20HE=2000 Lumens <sup>(1)(8)</sup> 24HE=2400 Lumens <sup>(1)(8)</sup> 29HE=2900 Lumens 34HE=3400 Lumens 39HE=3900 Lumens 44HE=4400 Lumens  <b>Standard Efficacy</b> 20=2000 Lumens <sup>(8),(10)</sup> 24=2400 Lumens <sup>(8),(10)</sup> 29=2900 Lumens <sup>(8)</sup> 34=3400 Lumens <sup>(8)</sup> 39=3900 Lumens <sup>(8)</sup> 44=4400 Lumens <sup>(8)</sup>	[Blank]=Ribbed Frosted Acrylic Lens (standard) S=Smooth Frosted Acrylic Lens RDP=Smooth Lens with Round Pattern Insert HRP=High- Efficiency Round Perf Inlay	UNV=Universal Voltage 120-277 347V=347 Volt <sup>(8)</sup> 48V=48 Volt Low-voltage (Class 2) <sup>(2)</sup>	GL=Single Element Fuse GM=Double Element Fuse	[Blank]=No emergency EL7W=7-watt, 120V-277V emergency battery pack installed <sup>(8)</sup> EL14W=14-watt 120V-277V emergency battery pack installed <sup>(8)</sup> ELV7W=7-watt, DLVP-compatible low voltage emergency battery pack installed <sup>(8)</sup> ELV14W=14-watt DLVP-compatible low voltage emergency battery pack installed <sup>(8)</sup> GTR2=Generator Transfer Relay <sup>(7)</sup> ETRD=Emergency Transfer Relay with dimming control <sup>(8)</sup>  <b>PROVIDE FIXTURE WITH SURFACE MOUNT KIT SK-22, WHITE FINISH</b>
		<b>Notes</b> (8) White tuning not available with this model. (10) Not compatible with WN driver.			<b>Notes</b> (2) Products also available in non-US voltages and frequencies for international markets. (5) 347 versions 6000 lumens and below are available with emergency options. SLD and step-dim options or sensors are not available. (C) Consult DLVP system pages for additional details and compatibility.	<b>Notes</b> (3) With integral test switch/indicator/laser test. For approximate delivered lumens multiply the lumens per watt of the desired fixture by the wattage of the emergency battery pack (100 lm/W x 7=700 lumens). IES-format photometry for luminaires under emergency operation available. Battery option increases total height by 1 inch. (6) Used to bypass local control during outage. Must be used in conjunction with UL 1008 device (provided by others). GTR2 option includes 2 relays on fixtures with dimming drivers. ETRD option only requires one relay when used on a dimming fixture. Must specify voltage as 120V or 277V when ordering these devices. 347 not available. (7) White tuning provides correlated color temperatures (CCT) between 3000K (warm) to 5000K (cool) or 2700K (warm) to 6500K (cool). Must be used in conjunction with W2A driver only. Must be used with two (2) 10V dimming control channels, 1 color, 1 intensity. Not compatible with other control or sensor options. Must be used in conjunction with W2A driver only. Must be used with two (2) 10V dimming control channels, 1 color, 1 intensity. Not compatible with other control or sensor options. (C) Consult DLVP system pages for additional details and compatibility.

CRI/CCT	Flex	Driver Type	Number of Drivers
CRI/CCT	Flex	Driver Type	Number of Drivers
L830=80CRI, 3000K L835=80CRI, 3500K L840=80CRI, 4000K L850=80CRI, 5000K L930=90CRI, 3000K L935=90CRI, 3500K L940=90CRI, 4000K L950=90CRI, 5000K L83050=80CRI 3000K-5000K White Tuning <sup>(7)</sup> L93050=90CRI 3000K-5000K White Tuning <sup>(7)</sup> L82765=80CRI 2700K-6500K White Tuning <sup>(7)</sup> L92765=90CRI 2700K-6500K White Tuning <sup>(7)</sup>	[Blank]=No Flex A3/8-4/18GDIM=3/8" Flex with 0-10V Dimming Leads A3/8-5/18GDIM=Flex with 0-10V Dimming Leads and Blue for alternate wiring. See below for details.	CD=0-10V Dimming Driver (1%-100% Dimming) SR=Sensor-ready Dimming Driver for LVP-D1 option (1%-100% Dimming) <sup>(8)</sup> SLTD=5th Light DALI Driver (5%-100% Dimming) <sup>(8)</sup> SLTD=5th Light Dimming Driver (1%-100% Dimming) <sup>(8)</sup> LV=DLVP Dimming Driver (0%-100% Dimming) <sup>(8)</sup> SD=Step Dimming Driver (50%-100% Dimming) LH=Lutron HiLume (LDE1 series) 1%-100% EcoSystem Driver with Soft-on Fade to Black dimming <sup>(7)</sup> LS=Lutron 5 Series (LDE5-Series) 5%-100% EcoSystem Driver <sup>(7)</sup> W2A = White Tuning, 2 ch, Analog 0-10V Intensity and CCT Control <sup>(7)</sup> WN=WaveLinx Wireless Fixture, No Sensor. <sup>(4),(6),(9)</sup>	1=1 Driver
<b>Notes</b> (7) White tuning provides correlated color temperatures (CCT) between 3000K (warm) to 5000K (cool) or 2700K (warm) to 6500K (cool). Must be used in conjunction with W2A driver only. Must be used with two (2) 10V dimming control channels, 1 color, 1 intensity. Not compatible with other control or sensor options.		<b>Notes</b> (2) White tuning provides correlated color temperatures (CCT) between 3000K (warm) to 5000K (cool) or 2700K (warm) to 6500K (cool). Must be used in conjunction with W2A driver only. Must be used with two (2) 10V dimming control channels, 1 color, 1 intensity. Not compatible with other control or sensor options.  Integrated options must be used in conjunction with the associated system and may not be compatible with other options or accessories. Please refer to the following: (A) Consult WaveLinx system pages for additional details and compatibility. (B) Consult LumaWatt Pro system pages for additional details and compatibility. (C) Consult DLVP system pages for additional details and compatibility. (D) Consult LumaWatt Pro system pages for additional details and compatibility. (E) Consult Fifth Light system pages for additional details and compatibility. (F) Consult Marketplace Options - Lutron system pages for additional details and compatibility. (G) Consult Marketplace Options - Lutron system pages for additional details and compatibility. (H) Available with UNV voltage only.	

Integrated Sensing Systems	Packaging	Accessories
Integrated Sensing Systems	Packaging	Accessories (order separately)
[Blank]=No Sensor SWPD1=WaveLinx Wireless Integrated Sensor <sup>(4)</sup> SDWP1=WaveLinx Wireless Integrated Sensor Dual Band <sup>(4),(4)</sup> LWIPD1=LumaWatt Pro Wireless Integrated Sensor <sup>(8)</sup> LDWP1=LumaWatt Pro Wireless Integrated Sensor Dual Band <sup>(8),(4)</sup> LWTPD1=LumaWatt Pro Wireless Tile-mount Sensor <sup>(8)</sup> SLVPD1=DLVP Low-voltage Integrated Sensor <sup>(2)</sup> SDLPD1=DLVP Low-voltage Integrated Sensor Dual Band <sup>(2),(4)</sup> SVDP1=0-10V Stand-alone Integrated Sensor <sup>(9)</sup> SDVPD1=0-10V Stand-alone Integrated Sensor Dual Band <sup>(9),(4)</sup>	U=Unit Pack PAL=Job Pack, out of carton PAC=Job Pack, in carton	CZ2-EQCLIP-U-PK=Cruze Plus "CZ2" Earthquake Clip Kit (4 clips per bag kit) <sup>(1)</sup> DF-22-W=2' x 2' Drywall Frame Kit SK-22-WS=2' x 2' Shallow Surface Mount Kit SK-22-WT=2' x 2' Tall Surface Mount Kit ISHH-01=Programming Remote for Integrated Sensor <sup>(3)</sup> ISHH-02=Personal Control Remote for Integrated Sensor <sup>(3)</sup>
<b>Notes</b> (4) Required for use with sensors and emergency options. Provides blank band on opposite side from sensor band to provide symmetric appearance. Integrated options must be used in conjunction with the associated system and may not be compatible with other options or accessories. Please refer to the following: (A) Consult WaveLinx system pages for additional details and compatibility. (B) Consult LumaWatt Pro system pages for additional details and compatibility. (C) Consult DLVP system pages for additional details and compatibility. (D) Consult SVDP series system pages for additional details and compatibility.		<b>Notes</b> (1) An EQ Grid Clip is recommended for all 9/16" ceiling systems. Four required per fixture. Integrated options must be used in conjunction with the associated system and may not be compatible with other options or accessories. Please refer to the following: (D) Consult SVDP series system pages for additional details and compatibility.

## Metalux

22CZ2 LED

TYPE L12

### Product Specifications

#### Construction

- Die formed of code gauge prime cold rolled steel with full length die-formed stiffeners
- Unibody endplates attached with interlocking tabs and screws
- Hemmed side flanges
- Four auxiliary fixture end suspension points
- Integral Grid-lock feature for endplates for added safety
- Optional earthquake clips available

#### Integrated Controls

- 0-10V dimming to 1% standard
- WaveLinx wireless fixture for sensor-less wireless control
- WaveLinx sensor compatible for IoT capability
- LumaWatt Pro sensor compatible for IoT capability
- SVPD sensor compatible for out of the box functionality
- DLVP sensor and driver compatible for low voltage applications
- DALI 2.0, Lutron, and step-dimming available

#### LED and Light Engine

- LED's available in 3000K, 3500K, 4000K, or 5000K at 80 CRI minimum and 90 CRI minimum
- TM21 life at 60,000 hours up to L94 and calculated L70 exceeds 290,000 hrs.
- Drivers available in 120-277V and 347V
- Color Tuning options available with Eaton's VividTune

#### Emergency Battery Options

- Optional 120-277V emergency battery available in 7W or 14W
- 90-minute backup period for code compliance
- Test switch with laser pointer and testing from floor feature for ease of use
- EZ Key feature prevents accidental discharge during construction
- Generator transfer options available

#### Finish

- Multistage, iron phosphate pretreatment
- 90% reflective, matte white enamel finish
- Full fixture housing painted after fabrication

#### Shielding

- Ribbed acrylic frosted lens standard
- Optional smooth acrylic frosted lens (S)
- Optional metal perforated acrylic lens (RDP)
- Optional High-Efficiency Round Perf Inlay (HRP)

#### Compliance

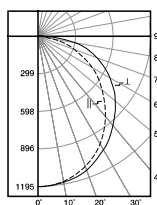
- IC rated for insulation contact
- cULus listed for damp locations
- RoHS compliant
- Tested to IESNA LM-79 and LM-80
- Stated life tested to TM21 standards
- Can be used for State of California Title 24 high efficacy luminaire

#### Warranty

- Five year warranty standard.

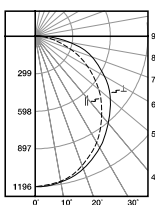
### Photometric Data

[View IES files](#)



#### 22CZ2-24-UNV-L830-CD1-U

Dimming Driver  
Linear LED 3000K  
Spacing criterion: (II) 1.2 x mounting height, (⊥)  
Lumens: 2437  
Input Watts: 21.9W  
Efficacy: 111.3 LPW  
Test Report: 22CZ2-24-UNV-L830-CD1-U.IES



#### 22CZ2-24HE-UNV-L830-CD1-U

Dimming Driver  
Linear LED 3000K  
Spacing criterion: (II) 1.19 x mounting height, (⊥)  
Lumens: 2402  
Input Watts: 19.2W  
Efficacy: 125.1 LPW  
Test Report: 14CZ2-29-UNV-L830-CD1-U.IES

# Metalux

# 22CZ2 LED

TYPE L12

## Energy and Performance Data

### Standard Efficacy Versions – Single Row of LEDs

Catalog Number	Lumens	Watts	lm/W
22CZ2-20-UNV-L835-CD1-U	2101	17.9	117
22CZ2-24-UNV-L835-CD1-U	2450	21.9	112
22CZ2-32-UNV-L835-CD1-U	3280	26.7	123
22CZ2-39-UNV-L835-CD1-U	3943	34.5	114
22CZ2-44-UNV-L835-CD1-U	4424	42.7	104

### High Efficacy Versions – Two Rows of LEDs

Catalog Number	Lumens	Watts	lm/W
22CZ2-20HE-UNV-L835-CD1-U	2044	16.0	128
22CZ2-24HE-UNV-L835-CD1-U	2416	19.2	126
22CZ2-29HE-UNV-L835-CD1-U	2942	22.2	133
22CZ2-34HE-UNV-L835-CD1-U	3386	25.8	131
22CZ2-39HE-UNV-L835-CD1-U	3930	30.3	130
22CZ2-44HE-UNV-L835-CD1-U	4464	25.0	128

### Shielding

Lumen Adjustment Factors		
S	RDP	HRP
1.05	0.67	0.80

### Lumen Calculator

CCT Multiplier	80 CRI	90 CRI
3000K	0.994	0.830
3500K	1.00	0.845
4000K	1.00	0.854
5000K	1.065	0.852

### Example of Lumen Adjustment Calculation

22CZ2-32-UNV-L935-CD1-U at 90CRI at 3500K

Lumen Adjustment Factor = 0.845

Total Light Output =

3,280 lm x 0.845 = 2,772 lm

Efficacy =  $\frac{2,772 \text{ lm}}{26.7 \text{ W}}$  103.8 lm/W

### Lumen Maintenance

Version	TM-21 Lumen Maintenance (60,000 hours)	Theoretical L70 (hours)
Standard	> 85%	> 131,000
High Efficiency	> 94%	> 290,000

### Load Data (Stock Product)

Thd	6%
Power Factor	0.99
Weight (lbs.)	10.6
Low Temp. Start	-20°C

### Shipping Data

Catalog No.	Wt.	Pallet 49" L x 52" W x 55" H
2' x 2'	12.5 lbs.	48



## Metalux

22CZ2 LED

TYPE L12

### Control Systems

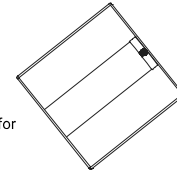
- WaveLinx
- DLVP
- LumaWatt Pro
- iLumin Plus
- VividTune

The Cruze ST with Integrated Sensor technology provides automatic energy savings without sacrificing performance. Traditionally, these types of energy savings required coordination between the luminaire and a lighting control system. The Cruze ST delivers superior lighting with integrated occupancy and daylighting controls.

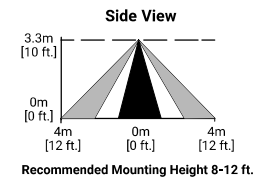
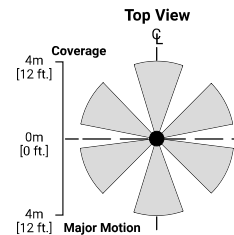
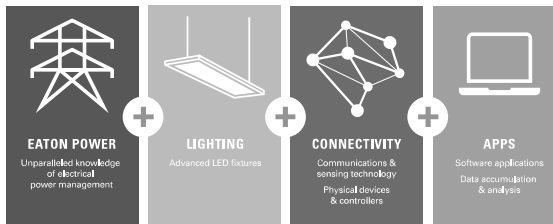
Capture the benefits of traditional lighting controls, without complicated coverage planning or special wiring. Ideal for new construction or retrofit, the Cruze ST delivers automatic ON to an energy saving light level, while ensuring lighting is turned OFF when the space is unoccupied.

The integral daylight sensor reduces the need for special daylight zone planning. Each luminaire will automatically adjust the light level based on reflected light beneath the sensor in a closed loop method.

The integral sensor can be offered in both standalone (SVPD1) and networked (SWPD1, LWIPD1, and SLVPD1) for application versatility.



### We make connections work



Installation of integrated sensors within 3-ft (1m) of HVAC air vents is not recommended.

### Systems comparison chart

Eaton provides many lighting system solutions designed to satisfy code requirements and meet the unique needs of any project.

	Distributed Low-Voltage Power System	WaveLinx	LumaWatt Pro
Space type	Interior	Interior/Outdoor	Any
Stand-alone or Network	Stand-alone	Both	Network
Need-based feature progression			
Basic compliance only	●	●	●
Occupancy sensing	●	●	●
Daylight harvesting	●	●	●
Zone control	●	●	●
Scheduling	●	●	●
0-10V dimming	●	●	●
Individual fixture control	●	●	●
<b>Retrofit+Building Integration</b>	●	●	●
Total wireless connectivity		●	●
A/V integration		●	●
BMS integration		●	●
UI options (touchscreen, apps, etc.)		●	●
<b>Enterprise level building integration</b>		●	●
Facility management & tools		●	●
Floor plan & reporting tools			●
<b>Value-added services</b>			●
Asset tracking			●
API integration		●	●
Analytics/higher problem solving			●



Connected Systems  
[CLICK HERE](#)

**Metalux**

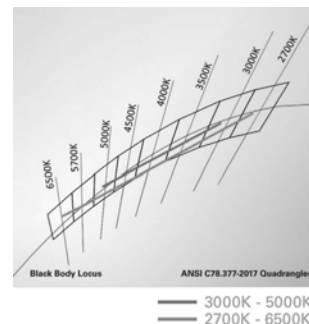
**22CZ2 LED**

**TYPE L12**

**VividTune™**  
color tuning solutions

## 22 Cruze ST LED with VividTune Tunable White

VividTune tunable white luminaires from Eaton deliver high-quality light in a broad range of continuously variable color temperatures and intensities. Create a dynamic environment by adjusting the ambient light warmer or cooler to influence mood, support the task at hand, or create a dramatic ambience. The ability to control correlated color temperature and intensity separately using simple controls is the next evolution of LED lighting for the commercial, educational, healthcare and hospitality space. The unparalleled flexibility and number of available lighting environments enable users to find the right light with tunable white.



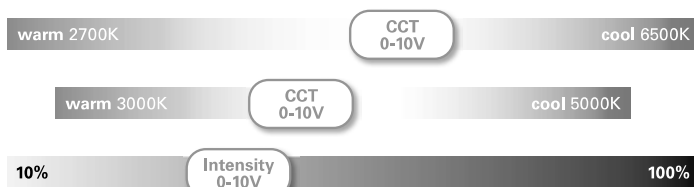
### Performance Data\*

Tunable White - Lumen Adjustment Factors				
CCT	3000K-5000K		2700K-6500K	
	80 CRI	90 CRI	80 CRI	90 CRI
2700K	-	-	0.868	0.741
3000K	0.894	0.736	0.893	0.771
3500K	0.946	0.804	0.924	0.809
4000K	0.993	0.868	0.944	0.835
4500K	1.002	0.883	0.961	0.857
5000K	1.002	0.883	0.974	0.874
6500K	-	-	0.988	0.897

2' x 2' Cruze ST LED - Example of Approximate Lumen Calculation			
	Standard Catalog #	VividTune 80 CRI Catalog #	VividTune 90 CRI Catalog #
CCT Setting	22CZ2-34HE-UNV-L835-CD1-U	22CZ2-34HE-UNV-L83050-W2A1-U	22CZ2-34HE-UNV-L93050-W2A1-U
3000K	-	3026	2491
3500K	3386	3202	2722
4000K	-	3362	2940
4500K	-	3394	2991
5000K	-	3394	2991

### Controlling VividTune Tunable White

VividTune luminaires make tunable white more accessible by using simple and familiar controls. From wall dimmers to wireless controls, VividTune tunable white luminaires are compatible with industry standard 0-10V dimming controls. A single 0-10V dimming input is used to control intensity (brightness) while a second 0-10V dimming input is used to adjust CCT. For suggested control configurations, go to [www.eaton.com/lighting](http://www.eaton.com/lighting) for tunable white application guides.



### Example of Lumen Adjustment Calculation

22CZ2-34HE-UNV-L83050-W2A1-U  
at 80 CRI tuned to 3500K

Adjusted Lumen =  
published lm x adjusted lm factor

Adjusted Lumen = 3386 x 0.946

Adjusted Lumen = 3202 lm

\* Lumen adjustment factors are for reference  
and may be different for each product selected.  
Refer to IES files for actual performance data on each.



Cooper Lighting Solutions  
1121 Highway 74 South  
Peachtree City, GA 30269  
P: 770-485-4800  
[www.eaton.com/lighting](http://www.eaton.com/lighting)

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Specifications and dimensions  
subject to change without notice.

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December 2, 2019 9:33 AM



## FEATURES & SPECIFICATIONS

**INTENDED USE** — Ideal for applications requiring general purpose emergency lighting exit sign.

**CONSTRUCTION** — Die-cast aluminum construction — compact housing. Brushed aluminum faceplate with matte black electrostatic polymeric trim. Clear lacquer finish on brushed face inhibits fingerprints and other surface contaminants. Also available in white housing.

Fully overlapping light seal prevents light leaks. Universal directional chevron knockouts are concealed and easily removed.

Provisions for conduit entry and pendant mounting.

Letters 6" high with 3/4" stroke, with 100 ft viewing distance rating, based upon UL924 standard.

**U.S. Patent No. 5,739,639.** Other patents pending.

**OPTICS** — The typical life of the exit LED lamp is 10 years.

**ELECTRICAL** — Dual-voltage input capability 120 or 277 VAC. Emergency models provided with test switch, status indicator and a battery that automatically recharges when normal power is restored.

Battery option: Emergency models provided with maintenance-free, sealed nickel-cadmium battery which provides 90 minutes of emergency power.

**INSTALLATION** — Quick-mount installation — less than 5 minutes. Universal mounting (top or end). Back mount — only available with single face. Completely concealed, easily removed mounting knockouts and hole plugs. No exposed hardware. Die-cast aluminum canopy provided. Faceplate accessory kit available for 1-face to 2-face field conversion, see accessories below.

**LISTINGS** — UL listed. Damp location listing 50°F to 104°F (10°C to 40°C). Meets UL 924, NFPA 101 (current Life Safety Code), NFPA 70-NEC and OSHA illumination standards.

**WARRANTY** — 5-year limited warranty. This is the only warranty provided and no other statements in this specification sheet create any warranty of any kind. All other express and implied warranties are disclaimed. Complete warranty terms located at: [www.acuitybrands.com/support/warranty/terms-and-conditions](http://www.acuitybrands.com/support/warranty/terms-and-conditions)

**Note:** Actual performance may differ as a result of end-user environment and application.

All values are design or typical values, measured under laboratory conditions at 25 °C.

Specifications subject to change without notice.

Catalog Number	TYPE X ALTERNATE MANUFACTURERS: SURELITES "CX" SERIES
Notes	DUAL LITE "SE DIE-CAST" SERIES HE WILLIAMS "EXIT/CA" SERIES
Type	



Die-Cast Aluminum Exit



LQC

LED LAMPS



### Specifications

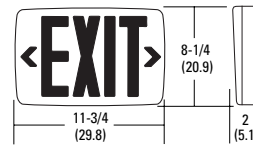
Length: 11-3/4 (29.8)

Depth: 2 (5.1)

Height: 8-1/4 (20.9)

Weight: 4.5 lbs. (2.0 kg)

All dimensions are inches (centimeters) unless otherwise specified.



### ORDERING INFORMATION

All configurations of this product are considered standard and have short lead times.

Example: LQC 1 R EL N

LQC				
Family	Housing color	Number of faces	Letter color	Operation
LQC	(blank) Matte black, brushed aluminum face W White	1 Single face 2 Double Face	R Red G Green	(blank) AC only 120/277 ELN 120/277 VAC input with nickel-cadmium battery back-up

REFER TO PLANS

### AS SELECTED BY ARCHITECT

#### Accessories: Order as separate item.

ELA WG1	Back-mount wireguard <sup>1</sup>
ELA B US12	12" pendant-mount kit with black canopy. To order white canopy, replace B with W in catalog number. To order 24" or 36" lengths, replace 12 with 24 or 36 <sup>2</sup>
ELA LQCFFPK	Brushed/black faceplate kit with red and green sign panel for 1-face to 2-face field conversion
ELA LQCBPK	Brushed/black aluminum backplate for 2-face to 1-face field conversion
ELA W LQCBPK	White backplate for 2-face to 1-face field conversion
ELA W LQCFFPK	White faceplate kit with red and green sign panel for 1-face to 2-face field conversion

#### Notes

- See spec sheet [ELA-WG](#).
- See spec sheet [ELA-ItemKits](#).

EMERGENCY

LQC

## LQC Quantum® Die-cast Aluminum LED

### SPECIFICATIONS

ELECTRICAL				
Primary Circuit				
Type	Typical LED life <sup>1</sup>	Supply voltage	Input watts	Max. amps
Red LED AC only	10 years	120	.6	.05
		277	.7	.06
Green LED AC only	10 years	120	1.0	.05
		277	1.2	.06
Red LED emergency	10 years	120	.6	.06
		277	.7	.05
Green LED emergency	10 years	120	1.0	.05
		277	1.2	.06

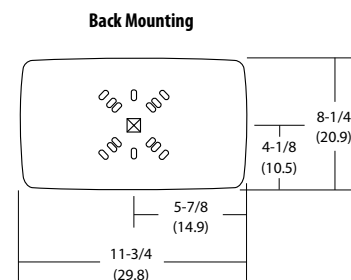
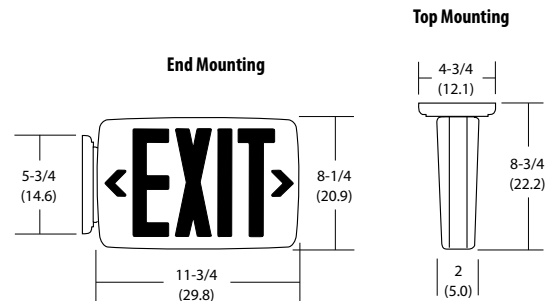
BATTERY (EL N option)			
Sealed Nickel-Cadmium			
Shelf life <sup>2</sup>	Typical life <sup>2</sup>	Maintenance <sup>3</sup>	Optimum temperature <sup>4</sup>
3 years	6 - 8 years	none	50°–104°F (10°–40°C)

#### Notes

- Based on continuous operation. The typical life of the LED lamp is 10 years.
- At 77°F (25°C).
- All life safety equipment, including emergency lighting for path of egress must be maintained, serviced, and tested in accordance with all National Fire Protection Association (NFPA) and local codes. Failure to perform the required maintenance, service, or testing could jeopardize the safety of occupants and will void all warranties.
- Temperature range where unit will provide capacity for 90 minutes. Higher and lower temperatures affect life and capacity.

### MOUNTING

All dimensions are inches (centimeters) unless otherwise specified.  
Shipping weight: 4.5 lbs. (2.0 kgs.)



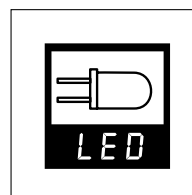
### KEY FEATURES



Faceplate accessory kit with red and green sign panels for 1-face to 2-face field conversion.



Quick-Mount installation less than 5 minutes.



The typical life of the LED lamp is 10 years.

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### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  - 1. Division 26 Section "Electrical General Requirements."

#### 1.02 SUMMARY

- A. This Section includes design and installation of new devices onto an existing fire alarm system.
- B. Related Sections include the following:
  - 1. Division 8 Section "Door Hardware" for door closers and holders with associated smoke detectors, electric door locks, and release devices that interface with the fire alarm system.

#### 1.03 DEFINITIONS

- A. FACP: Fire alarm control panel.
- B. LED: Light-emitting diode.
- C. NICET: National Institute for Certification in Engineering Technologies.
- D. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

#### 1.04 SYSTEM DESCRIPTION

- A. Existing Simplex System.
  - 1. Interface with existing fire alarm system.

- B. Fire alarm system shall consist of the following:
  - 1. System smoke detection as required at air handling units, smoke rated transfer openings, and smoke damper locations.
  - 2. System smoke detection in areas identified on plans
  - 3. Audible and visual notification appliances in all public and common areas of the building.

#### **1.05 PERFORMANCE REQUIREMENTS**

- A. Comply with NFPA 72.
- B. Comply with NFPA 70.
- C. A complete functional system meeting the requirements of this specification, including alarm initiating devices and notification appliances at locations and ratings to meet the requirements of the Authorities Having Jurisdiction and all applicable codes shall be provided.
- D. Coordinate and avoid conflicts with casework, markerboards, feature walls, and other areas where fire alarm devices would interfere with furnishings, finishes, etc.
- E. Fire alarm system vendor shall provide sound pressure level calculations demonstrating compliance with NFPA 72 and establish quantities and tap settings of audible devices.
- F. No additional charges for work or equipment required for a code compliant system approved by the Authority Having Jurisdiction will be allowed.
- G. Obtain and refer to mechanical drawings for smoke damper locations, smoke rated transfer openings, and air handling equipment CFM's. Provide smoke detection as required by applicable codes.

#### **1.06 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
  - 1. Shop Drawings shall be prepared by persons with the following qualifications:
    - a. Trained and certified by manufacturer in fire alarm system design.
    - b. Fire alarm certified by NICET, minimum Level III.
  - 2. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
  - 3. Device Address List: Include address descriptions that will appear on the FACP display.
  - 4. System riser diagram with device addresses, conduit sizes, and cable and wire types and sizes.
  - 5. Wiring Diagrams: Power, signal, and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show wiring color code.
  - 6. Batteries: Provide battery sizing calculations. Battery size shall be a minimum of 125% of the calculated requirement.
  - 7. Duct Smoke Detectors: Performance parameters and installation details for each detector, verifying that each detector is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
  - 8. Ductwork Coordination Drawings: Plans, sections, and elevations of ducts, drawn to scale and coordinating the installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, the detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
  - 9. Floor Plans: Indicate final outlet locations showing address of each addressable device. Show device layout, size and route of cable and conduits.
- C. Qualification Data: For Installer.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For fire alarm system to include in emergency, operation, and maintenance manuals. Comply with NFPA 72, Appendix A, recommendations for Owner's manual. Include abbreviated operating instructions for mounting at the FACP.

- F. Submittals to Authorities Having Jurisdiction: In addition to distribution requirements for submittals specified in Division 1 Section "Submittals," make an identical submittal to authorities having jurisdiction. To facilitate review, include copies of annotated Contract Drawings as needed to depict component locations. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.
- G. Documentation:
  - 1. Approval and Acceptance: Provide the "Record of Completion" form according to NFPA 72 to Owner, Architect, and Authorities Having Jurisdiction.
  - 2. Record of Completion Documents: Provide the "Permanent Records" according to NFPA 72 to Owner, Architect, and authorities having jurisdiction. Format of the written sequence of operation shall be the optional input/output matrix.
    - a. Hard copies on paper to Owner, Architect, and Authorities Having Jurisdiction.
    - b. Electronic media may be provided to Architect.

#### **1.07 QUALITY ASSURANCE**

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Work of this Section be performed by a UL-listed company.
- C. Installer Qualifications: Personnel certified by NICET as Fire Alarm Level III.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

#### **1.08 PROJECT CONDITIONS**

- A. Interruption of Existing Fire Alarm Service: Do not interrupt fire alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
  - 1. Notify Architect, Construction Manager and Owner no fewer than seven days in advance of proposed interruption of fire alarm service.
  - 2. Do not proceed with interruption of fire alarm service without Architect, Construction Manager and Owner written permission.

### **PART 2 - PRODUCTS**

#### **2.01 EXISTING FIRE ALARM SYSTEM**

- A. Compatibility with Existing Equipment: Fire alarm system and components shall operate as an extension of an existing system.

#### **2.02 SYSTEM SMOKE DETECTORS**

- A. General Description:
  - 1. UL 268 listed, operating at 24-V dc, nominal.
  - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
  - 3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
  - 4. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status.
  - 5. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
- B. Photoelectric Smoke Detectors:
  - 1. Sensor: LED or infrared light source with matching silicon-cell receiver.
  - 2. Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.

- C. Ionization Smoke Detector:
  - 1. Sensor: Responsive to both visible and invisible products of combustion. Self-compensating for changes in environmental conditions.
  - 2. Detector Sensitivity: Between 0.5 and 1.7 percent/foot smoke obscuration when tested according to UL 268A.
- D. Duct Smoke Detectors:
  - 1. Photoelectric Smoke Detectors:
    - a. Sensor: LED or infrared light source with matching silicon-cell receiver.
    - b. Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.
  - 2. Ionization Smoke Detectors:
    - a. Sensor: Responsive to both visible and invisible products of combustion. Self-compensating for changes in environmental conditions.
    - b. Detector Sensitivity: Between 0.5 and 1.7 percent/foot smoke obscuration when tested according to UL 268A.
  - 3. UL 268A listed, operating at 24-V dc, nominal.
  - 4. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
  - 5. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.
    - a. Weatherproof Duct Housing Enclosure: UL listed for use with the supplied detector. The enclosure shall comply with NEMA 250 requirements for Type 4X.
  - 6. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
  - 7. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status. Provide remote status and alarm indicator and test station where required.
  - 8. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
  - 9. Each sensor shall have multiple levels of detection sensitivity.
  - 10. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.
  - 11. Relay Fan Shutdown: Provide two (2) sets of contacts rated to interrupt fan motor-control circuit.

## **2.03 NOTIFICATION APPLIANCES**

- A. Description: Equipped for mounting as indicated and with screw terminals for system connections.
  - 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.
  - 2. Finishes:
    - a. Wall mounted appliances: Provide red finish with white lettering.
    - b. Ceiling Mounted Appliances: Provide white finish.
- B. Voice/Tone Speakers:
  - 1. UL 1480 listed.
  - 2. High-Range Units: Rated 2 to 15 W.
  - 3. Low-Range Units: Rated 1 to 2 W.
  - 4. Matching Transformers: Tap range matched to the acoustical environment of the speaker location.
- C. Visible Alarm Devices: Xenon strobe lights listed under UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.
  - 1. Rated Light Output: 15, 30, 60, 75, 110, 135, 185 candela as required to meet NFPA 72 requirements.



2. Strobe Leads: Factory connected to screw terminals.

#### **2.04 MAGNETIC DOOR HOLDERS**

- A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching door plate.
  1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
  2. Wall-Mounted Units: Flush mounted, unless otherwise indicated.
  3. Rating: 24-V ac or dc.
  4. Rating: 120-V ac.
- B. Material and Finish: Match door hardware.

#### **2.05 ADDRESSABLE INTERFACE DEVICE**

- A. Description: Microelectronic monitor module listed for use in providing a system address for listed alarm-initiating devices for wired applications with normally open contacts.

#### **2.06 ADDRESSABLE CONTROL MODULE**

- A. Provide for integration of auxiliary control functions into the analog signaling circuit. Intelligent analog signaling circuit control module shall have the following capabilities:
  1. Communication interaction with the analog signaling circuit having the capability of initiating a control function to an auxiliary device based on a specified event.
  2. Provide NO/NC contact pairs rated at 2 amps 120 VAC or 24 VDC.

#### **2.07 WIRE AND CABLE**

- A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with NFPA 70, Article 760.
- B. Fire alarm wire and cable shall be as specified by the system manufacturer including conductor gage, conductor quantity, conductor twists and shielding required to meet NFPA class and style performance specified.
- C. Signaling Line Circuits and other power limited fire alarm circuits (PLFA):
  1. PLFA circuits installed in conduit or raceway: U.L. Listed type FPL
  2. PLFA circuit cable installed exposed in accessible ceiling spaces, risers and elsewhere: U.L. Listed type FPLP.
  3. PLFA circuits installed where 2 hr rating is required to meet the survivability requirements of NFPA 72: Circuit integrity cable, NFPA 70 Article 760, Classification CI, UL listed as Type FPL, FPLR or FPLP as required, and complying with requirements in UL 1424 and in UL 2196 for a 2-hour rating.
- D. Non-Power-Limited Fire Alarm Circuits (NPLFA):
  1. NPLFA circuits installed in conduit: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
    - a. Low-Voltage Circuits: No. 16 AWG, minimum.
    - b. Line-Voltage Circuits: No. 12 AWG, minimum.
  2. NPLFA circuit cable installed exposed in ceiling spaces, risers and elsewhere: Multi-conductor cable, U.L Listed type NPLFP.
  3. NPLFA circuits installed where 2 hr rating is required to meet the survivability requirements of NFPA 72: Multi-conductor cable, U.L Listed type NPLFP-CI
  4. NPLFA circuit cable installed exposed in ceiling spaces, shafts and elsewhere: Multi-conductor Armored Cable, NFPA 70 Type MC, copper conductors, copper drain wire, aluminum or steel armor with red identifier stripe, UL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

## **PART 3 - EXECUTION**

### **3.01 EQUIPMENT INSTALLATION**

- A. Connecting to Existing Equipment: Verify that existing fire alarm system is operational before making changes or connections.
  - 1. Connect new equipment to the existing control panel in the existing part of the building.
  - 2. Connect new equipment to the existing monitoring equipment at the Supervising Station.
  - 3. Expand, modify, and supplement the existing control and monitoring equipment as necessary to extend the existing control and monitoring functions to the new points.
  - 4. New components shall be capable of merging with the existing configuration without degrading the performance of either system.
- B. Smoke or Heat Detector Spacing:
  - 1. Smooth ceiling spacing shall not exceed 30 feet or the listed spacing of the detectors, whichever is less.
  - 2. Spacing of heat detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas, shall be determined according to Appendix A in NFPA 72.
  - 3. Spacing of heat detectors shall be determined based on guidelines and recommendations in NFPA 72.
- C. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
- D. Duct Smoke Detectors: Comply with NFPA 72. Install sampling tubes so they extend the full width of the duct.
- E. Remote Status and Alarm Indicators: Install near each smoke detector, each duct detector that is above 10'-0" aff, concealed, or otherwise not readily visible from normal viewing position. Coordinate exact locations with local fire department and submit to architect for approval.
- F. Audible Alarm Notification Appliances: Install wall mounted appliances not less than 6 inches below the ceiling.
- G. Visible Alarm Notification Appliances: Install wall mounted appliances at 96" AFF or 6 inches below the ceiling, whichever is less.
- H. Coordinate ceiling mounted appliances with reflected ceiling plans. Do not install visual appliances where pendant mounted or suspended lighting fixtures will obstruct intended viewing angles.
- I. Install wall mounted and ceiling mounted notification appliances flush on recessed j-box or back box for all new work and on existing gyp-board partition walls.
- J. Install notification appliances on existing CMU walls on surface back-boxes matching the dimensions and finish of the notification appliance.
- K. Device Location-Indicating Lights: Locate in public space near the device they monitor.

### **3.02 WIRING INSTALLATION**

- A. Install wiring according to the following:
  - 1. NECA 1.
  - 2. TIA/EIA 568-A.
- B. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceways and Boxes."
  - 1. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.
- C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

- E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.
- F. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum 1-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.
- G. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

### **3.03 IDENTIFICATION**

- A. Identify system components, wiring, cabling, and terminals according to Division 26 Section "Electrical Identification."
- B. Install instructions frame in a location visible from the FACP.
- C. Paint power-supply disconnect switch red and label "FIRE ALARM."

### **3.04 GROUNDING**

- A. Ground the FACP and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to the FACP.

### **3.05 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
  - 1. Before requesting final approval of the installation, submit a written statement using the form for Record of Completion shown in NFPA 72.
  - 2. Perform each electrical test and visual and mechanical inspection listed in NFPA 72. Certify compliance with test parameters. All tests shall be conducted under the direct supervision of a NICET technician certified under the Fire Alarm Systems program at Level III.
    - a. Include the existing system in tests and inspections.
  - 3. Visual Inspection: Conduct a visual inspection before any testing. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.
  - 4. Testing: Follow procedure and record results complying with requirements in NFPA 72.
    - a. Detectors that are outside their marked sensitivity range shall be replaced.
  - 5. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in NFPA 70.

### **3.06 PROGRAMMING**

- A. Coordinate final address descriptions for alarm, supervisory and trouble indication that appear on FACP and Annunciator displays with the Owners representative. This shall include all room names, room numbers, building areas for fire protection zones, exit door descriptions and similar items. This coordination shall take place and be implemented in the programming prior to Demonstration and Owner Training.

**3.07 ADJUSTING**

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.
- B. Follow-Up Tests and Inspections: After date of Substantial Completion, test the fire alarm system complying with testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for three monthly, and one quarterly, periods.
- C. Semiannual Test and Inspection: Six months after date of Substantial Completion, test the fire alarm system complying with the testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- D. Annual Test and Inspection: One year after date of Substantial Completion, test the fire alarm system complying with the testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for monthly, quarterly, semiannual, and annual periods. Use forms developed for initial tests and inspections.

**3.08 WARRANTY**

- A. All newly installed equipment shall be warranted by the contractor for a period of one year following acceptance. The warranty shall include parts, labor, prompt field service, pickup and delivery.

**3.09 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the fire alarm system, appliances, and devices. Refer to Division 1 Section Demonstration and Training."

**END OF SECTION 28 3100**