

SWOCC COALEDO AND SUMNER HALL RENOVATIONS  
EDA AWARD NO. 07-01-07738  
1988 NEWMARK AVENUE COOS BAY, OR 97420

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PROJECT MANUAL - VOLUME 1 OF 2  
SPECIFICATIONS DIVISIONS 01 - 14

PROJECT BIDDING  
MARCH 03, 2023





COALEDO HALL
SUMNER HALL

PROJECT MANUAL - VOLUME 1 OF 2

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

X	X	00 01 00	Specifications Table of Contents
X	X	00 11 13	Bid Solicitation
X	X	00 21 13	Instructions to Bidders
X	X	00 21 13B	AIA Document A701 Instructions to Bidders
X	X	00 22 10	Supplementary Instructions to Bidders
X	X	00 41 00	Bid Form
X	X	00 43 25	Substitution Request Form During Procurement
X	X	00 52 00	Agreement Form
X	X	00 52 00B	AIA Document A101 Standard Form of Agreement
X	X	00 72 00	Form of General Conditions
X	X	00 73 46B	AIA Document A201 General Conditions of the Contract
X	X	00 73 00	Supplementary Conditions
X	X	00 73 46	Davis-Bacon and Prevailing Wage Rates
X	X	00 73 46B	Wage Determination Online Homepage
X	X	00 73 46C	EDA Contracting Provisions
X	X	00 73 46D	Affirmative Action Requirements
X	X	00 73 46E	Lobby Restriction Form CD-512

DIVISION 01 - GENERAL REQUIREMENTS

X	X	01 10 00	Summary
X	X	01 25 00	Substitution Procedures
X	X	Form	Substitution Request Form, Bid Phase
X	X	Form	Substitution Request Form, CA Phase
X	X	01 26 00	Contract Modification Procedures
X	X	01 29 00	Payment Procedures
X	X	01 31 00	Project Management and Coordination
X	X	01 32 00	Construction Progress Documentation
X	X	01 33 00	Submittal Procedures
X	X	01 40 00	Quality Requirements
X	X	01 50 00	Temporary Facilities and Controls
X	X	01 57 22	Construction Indoor Air Quality
X	X	01 60 00	Product Requirements
X	X	01 60 10	Finish and Material Legend
X	X	01 61 16	Delegated Design Requirements
X	X	01 73 00	Execution
X	X	01 74 19	Construction Waste Management and Disposal
X	X	01 77 00	Closeout Procedures
X	X	01 78 23	Operation and Maintenance Data

COALEDO HALL
SUMNER HALL

X	X	01 78 39	Project Record Documents
X	X	01 79 00	Demonstration and Training

DIVISION 02 - EXISTING CONDITIONS

X	X	02 41 19	Selective Demolition
X	X	02 82 13	Asbestos Abatement Report

DIVISION 03 - CONCRETE

X		03 30 00	Cast-In-Place Concrete
X		03 54 13	Gypsum Cement Underlayment

DIVISION 04 - MASONRY

		NOT USED
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DIVISION 05 METAL

X	X	05 50 00	Metal Fabrications
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DIVISION 06 WOOD AND PLASTIC

X	X	06 10 10	Rough Carpentry
X	X	06 16 00	Sheathing
X	X	06 20 13	Exterior Finish Carpentry
X	X	06 20 23	Interior Finish Carpentry
X	X	06 41 10	Architectural Casework

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

X	X	07 01 50.19	Preparation for Re-Roofing
X	X	07 21 00	Thermal Insulation
X	X	07 25 00	Weather Barriers
X	X	07 46 46	Fiber-Cement Siding
X	X	07 54 23	Thermoplastic Polyolefin (TPO) Roofing
X	X	07 62 00	Sheet Metal Flashing and Trim
X	X	07 92 00	Joint Sealants

DIVISION 08 - OPENINGS

X		08 11 13	Hollow Metal Doors and Frames
X	X	08 14 16	Flush Wood Doors
X	X	08 31 13	Access Doors and Frames
X		08 41 13	Aluminum-Framed Entrances and Storefronts
X	X	08 71 00	Door Hardware
X	X	08 71 00.01	Door Hardware Index
X	X	08 80 00	Glazing
X	X	08 91 19	Fixed Louvers

COALEDO HALL
SUMNER HALL

DIVISION 09 - FINISHES

X	X	09 22 16	Non-Structural Metal Framing
	X	09 26 13	Gypsum Veneer Plastering
X	X	09 29 00	Gypsum Board
X	X	09 30 00	Tiling
X	X	09 51 23	Acoustic Panel Ceilings
X		09 54 26	Linear Wood Ceilings
X	X	09 65 00	Resilient Flooring
X	X	09 65 13	Resilient Base and Accessories
X	X	09 68 00	Carpeting
X		09 72 12	Fiberglass Reinforced Wall Covering
X	X	09 84 33	Sound-Absorbing Wall Panels
X	X	09 91 00	Painting
X	X	09 96 00	High-Performance Coatings

DIVISION 10 - SPECIALTIES

X	X	10 11 00	Visual Display Units	10 12 00 Display Cases
X	X	10 14 00	Panel Signage	
X	X	10 21 13	Toilet Compartments	
X	X	10 26 00	Wall Protection	
X	X	10 28 00	Restroom and Custodial Accessories	
X	X	10 44 00	Fire Protection Cabinets	

DIVISION 11 - EQUIPMENT

X		11 31 10	Appliances
X	X	11 53 10	Laboratory Casework and Other Furnishings

DIVISION 12 - FURNISHINGS

X	X	12 24 13	Roller Window Shades
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DIVISION 13 - SPECIAL CONSTRUCTION

NOT USED

DIVISION 14 - CONVEYING EQUIPMENT

NOT USED

PROJECT MANUAL - VOLUME 2 OF 2

DIVISION 01 - GENERAL REQUIREMENTS

X	X	00 01 00	Specifications Table of Contents
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COALEDO HALL
SUMNER HALL

#### DIVISION 21 - FIRE SUPPRESSION

As determined by Plumbing Engineer

X	X
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#### DIVISION 22 - PLUMBING

X	X	22 00 00	General Requirements for Plumbing
X	X	22 05 16	Expansion Fittings and Loops for Plumbing Piping
X	X	22 05 17	Sleeves and Sleeve Seals for Plumbing Piping
X	X	22 05 19	Meters and Gauges for Plumbing Piping
X	X	22 05 23	General -Duty Values for Plumbing Piping
X	X	22 05 29	Hangers and Supports for Plumbing Piping and Equipment
X	X	22 05 53	Identification for Plumbing Piping and Equipment
X	X	22 07 19	Plumbing Piping Insulation
X	X	22 10 05	Plumbing Piping
X	X	22 10 06	Plumbing Piping Specialties
X	X	22 22 00	Laboratory Plumbing
X	X	22 30 00	Plumbing Equipment
X	X	22 40 00	Plumbing Fixtures

#### DIVISION 23 - HEATING VENTILATING AND COOLING

X	X	23 00 00	General Requirements for HVAC
X	X	23 05 93	Testing, Adjusting, and Balancing for HVAC
X	X	23 07 13	Duct Insulation
X	X	23 31 00	HVAC Ducts and Casings
X	X	23 33 00	Air Duct Accessories

#### DIVISION 26 - COMMUNICATIONS

X	X	26 05 19	Low-Voltage Electrical Power Connections and Cables
X	X	26 05 26	Grounding and Bonding for Electrical Systems
X	X	26 05 29	Hangers and Supports for Electrical Systems
X	X	26 05 33.13	Conduit for Electrical Systems
X	X	26 05 33.16	Boxes for Electrical Systems
X	X	26 05 33.23	Surface Raceways for Electrical Systems
X	X	26 05 36	Cable Trays for Electrical Systems
X	X	26 05 48	Vibration and Seismic Controls for Electrical Systems
X	X	26 05 53	Identification for Electrical Systems
X	X	26 05 83	Wiring Connections
X	X	26 09 23	Lighting Control Devices
X	X	26 22 00	Low-Voltage Transformers
X	X	26 24 16	Panelboards
X	X	26 27 26	Wiring Devices
X	X	26 28 13	Fuses
X	X	26 28 16.13	Enclosed Circuit Breakers

COALEDO HALL
SUMNER HALL

X	X	26 28 16.16	Enclosed Switches
X	X	26 43 00	Surge Protective Devices
X	X	26 51 00	Interior Lighting
X	X	26 56 00	Exterior Lighting
X	X	26 60 00	Laboratory Electrical Requirements

#### DIVISION 27 - ELECTRICAL

X	X	27 05 29	Hangers and Supports for Communications Systems
X	X	27 05 33.13	Conduit for Communications Systems
X	X	27 10 00	Structured Cabling

#### DIVISION 28 - ELECTRICAL SAFETY AND SECURITY

X	X	28 46 00	Fire Detection and Alarm
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#### DIVISION 31 - EARTHWORK

X	X
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As determined by Civil Engineer

#### DIVISION 32 - EXTERIOR IMPROVEMENTS

X	X
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As determined by Civil Engineer and  
Landscape Architect

#### DIVISION 33 - UTILITIES

X	X
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As determined by Civil Engineer

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SECTION 00 11 13 - BID SOLICITATION

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.

**Sealed bids for Southwestern Oregon Community College (SWOCC) Coaledo and Sumner Hall Renovations, will be received from qualified bidders at SWOCC, Attn: Jeff Whitey, VP for Administrative Services, 1988 Newmark Avenue, Coos Bay, Oregon 97420, until the bid closing time of 1:00 P.M. Pacific Time, Thursday, May 18, 2023. The actual bid opening shall be conducted immediately following the bid closing time at 1:00 P.M. at the SWOCC Board Room, at which time the bids will be publicly opened and read aloud.**

Work on this Contract includes Building Improvements to Coaledo Hall and Sumner Hall within the Southwestern Oregon Community College Campus. The existing Coaledo Hall will be renovated to create new labs for Forestry / Sustainable Agriculture and Technology. Sumner Hall will be renovated to create news labs for Dental Assisting and Paramedicine.

The project design and construction is being funded in part by federal funds from the U.S. Department of Commerce - Economic Development Administration (EDA) - Public Works and Economic Adjustment Assistance (PWEDA) program and therefore is subject to the Federal laws and regulation associated with this program. Federal procurement requirements related for this project are found in the Contract Documents.

Bidding documents may be reviewed at the digital planroom of Willamette Print and Blueprint Company, Inc. (WPB) website: <https://wpbinc.com>; phone number: 503-223-5011. Hard copies of contract documents may be purchased via the WPB website with bidders ensuring they are properly registered as a planholder for this project. Bidding and Construction Documents for this work may also be examined at the Office of the Architect, OPSIS Architecture LLP, 920 NW 17th Ave., Portland, Oregon 97209, phone: 503-525-9511; and at SWOCC Maintenance Office, and various plan centers. Refer to Instructions to Bidders for a complete summary of all bidding requirements.

**A pre-bid meeting and walk-through of the project will be held at the job site at 1:00 P.M. Pacific Time, on Thursday, April 20, 2023. Contractors shall meet at the front entrance of the Student Recreation Center. The walk-thru is mandatory for general contractor bidders.**

This contract is for public work and is subject to the Davis-Bacon Act (40 U.S.C. 276a) as well as ORS 279C.800 to 279C.870 Prevailing Wage Rates, whichever is higher. Bidder's attention is directed to the requirements of employment and minimum wage rates to be paid. No bid will be considered or received unless the bid contains a statement by the bidder as part of its bid that Contractor agrees to be bound by, and will comply with the provisions of 40 U.S.C. 276a and ORS 279C.840 relating to Davis-Bacon Act or Prevailing Wages. Before starting work on this Contract, Contractor and all subcontractors must have on file with the Construction Contractors Board a Public Works Bond in the amount of \$10,000.

Bids must be fully completed in the manner provided in the Instructions to Bidders upon the official bid form provided within the Project Manual, and accompanied by a certified check or a bid bond executed in favor of SWOCC in an amount not less than ten percent (10%) of the total amount of the bid per ORS 279C.385, to be forfeited as fixed and liquidated damages should the bidder fail or neglect to enter into a contract and provide suitable bond for the faithful performance of the work in the event the contract is awarded.

Each bid will contain a statement as to whether or not the bidder is a resident bidder as defined in ORS 279A.120. Bidder must be registered with the Construction Contractors Board as required by ORS 701.035 to 701.055. The Owner reserves the right to reject any and all bids, and to waive any technicalities or

informalities in connection therewith. No bidder may withdraw their bid until the lapse of thirty (30) days from the bid opening.

By: Jeff Whitey, VP of Administrative Services  
Southwestern Oregon Community College

Published:  
*DJC, Portland, Oregon*  
*The World , Coos Bay, Oregon*

## SECTION 00 21 13 - INSTRUCTIONS TO BIDDERS

### 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. See AIA document A701 (1997 edition), instructions to bidders following this document.

#### 1.3 RELATED DOCUMENTS

- A. Document 00 11 13 "Advertisement for Bidders".
- B. Document A701 - 1997 "INSTRUCTIONS TO BIDDERS".
- C. Document 00 22 10 "Supplementary Instructions To Bidders".
- D. Document 00 41 00 "Bid Form".
- E. Document 00 43 25 "Substitution Request Form - During Procurement".

### PART 2 - INVITATION

#### 2.1 BID SUBMISSION

- A. Bids signed, executed, and dated will be received at the office of the Owner at Southwestern Oregon Community College, Attn: Jeff Whitey, VP for Administrative Services, 1988 Newmark Avenue, Coos Bay, Oregon 97420 before 1:00 p.m. local standard time on the 18<sup>th</sup> day of May 2023.
- B. Offers submitted after the above time shall be returned to the bidder unopened.
- C. Offers will be opened publicly immediately after the time for receipt of bids at the Southwestern Oregon Community College Board Room.
- D. 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.

### PART 3 - BID DOCUMENTS AND CONTRACT DOCUMENTS

#### 3.1 DEFINITIONS

- A. Bid Documents: Contract Documents supplemented with Bid Solicitation, Instructions to Bidders, Bid Form, Supplements to Bid Forms and Appendices and Bid securities identified.
- B. Contract Documents: Defined in Project Manual including issued Addenda.

#### 3.2 AVAILABILITY

- A. Bidding documents may be reviewed at the digital planroom of Willamette Print and Blueprint Company, Inc. (WPB) website: <https://wpbinc.com>; phone number: 503-223-5011. Hard copies of contract documents may be purchased via the WPB website with bidders ensuring they are properly registered as a planholder for this project.
- B. 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.

### 3.3 EXAMINATION

- A. Bidding and Construction Documents for this work may also be examined at the Office of the Architect, OPSIS Architecture LLP, 920 NW 17th Ave., Portland, Oregon 97209, phone: 503-525-9511; and at the following locations: SWOCC Maintenance Office, and various plan centers.
- B. Upon receipt of Bid Documents verify that documents are complete. Notify Architect should the documents be incomplete.
- C. Immediately notify Architect upon finding discrepancies or omissions in the Bid Documents.

### 3.4 INQUIRIES/ADDENDA

- A. Direct questions to Architect, OPSIS Architecture LLP, telephone 503-525-9511.
- B. Addenda may be issued during the bidding period. All Addenda become part of the Contract Documents. Include resultant costs in the Bid Amount.
- C. Verbal answers are not binding on any party.
- D. 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.

### 3.5 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

- A. Where the Bid Documents stipulate a particular product, substitutions will be considered up to 10 days before receipt of bids.
- B. Submit substitution requests by completing the form in Section 00 43 25 - Substitution Request Form - During Procurement; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- C. When a request to substitute a product is made, Architect may approve the substitution and will issue an Addendum to known bidders.
- D. The submission shall provide sufficient information to determine acceptability of such products.
- E. Provide complete information on required revisions to other work to accommodate each proposed substitution.
- F. Provide products as specified unless substitutions are submitted in this manner and accepted.

## PART 4 - SITE ASSESSMENT

### 4.1 SITE EXAMINATION

- A. Examine the project site before submitting a bid. Refer to Article 2 Bidder's Representations, AIA Document A701 Instructions to Bidders.

### 4.2 PREBID CONFERENCE

- A. A pre-bid conference and project job walk will be held at 2:00 p.m., Thursday, April 20, 2023. Contractors shall meet at the front entrance of the Student Recreation Center.
- B. Information relevant to the Bid Documents will be recorded in an Addendum, issued to Bid Document recipients.

## PART 5 - BID SUBMISSION

### 5.1 SUBMISSION PROCEDURE

- A. Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed.

- B. Submit one copy of the executed offer on the Bid Forms provided, signed and sealed with the required security in a closed opaque envelope, clearly identified with bidder's name, project name and Owner's name on the outside.
- C. An abstract summary of submitted bids will be made available to all bidders following bid opening.

END OF SECTION

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# DRAFT AIA® Document A701® – 2018

## Instructions to Bidders

for the following Project:

(Name, location, and detailed description)

«Southern Oregon Community College »  
«Coaledo and Sumner Hall Restoration »  
«1988 Newmark Avenue  
Coos Bay, Oregon 97420 »

### THE OWNER:

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

«Southwestern Oregon Community College »« »  
«1988 Newmark Avenue»  
«Coos Bay, Oregon »  
«97420 »

### THE ARCHITECT:

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

«Opsis Architecture, LLP »« »  
«920 NW 17<sup>th</sup> Avenue »  
«Portland, Oregon »  
«97209 »

## TABLE OF ARTICLES

- 1 DEFINITIONS
- 2 BIDDER'S REPRESENTATIONS
- 3 BIDDING DOCUMENTS
- 4 BIDDING PROCEDURES
- 5 CONSIDERATION OF BIDS
- 6 POST-BID INFORMATION
- 7 PERFORMANCE BOND AND PAYMENT BOND
- 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

### 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.

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™-2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

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## ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

## ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- .1 the Bidder has read and understands the Bidding Documents;
- .2 the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- .3 the Bid complies with the Bidding Documents;
- .4 the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- .5 the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- .6 the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

## ARTICLE 3 BIDDING DOCUMENTS

### § 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

*(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)*

«Electronic download or purchase from plan centers. »

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper



documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

## § 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.

*(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)*

«Email to Mark Stoller at marks@opsisarch.com »

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

## § 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

### § 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

## § 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

*(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)*

«Addenda will be emailed to plan centers. »

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

## ARTICLE 4 BIDDING PROCEDURES

### § 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

### § 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

*(Insert the form and amount of bid security.)*

«In the form and amount required if so stipulated in the Instructions to Bidders. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. The amount of the bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Section 6.2. »

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning « » days after the opening of Bids, withdraw its Bid and request the return of its bid security.

### § 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:

*(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)*

«All copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof. »

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

### § 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:

*(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)*

## **ARTICLE 5 CONSIDERATION OF BIDS**

### **§ 5.1 Opening of Bids**

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

### **§ 5.2 Rejection of Bids**

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

### **§ 5.3 Acceptance of Bid (Award)**

**§ 5.3.1** It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

**§ 5.3.2** Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

## **ARTICLE 6 POST-BID INFORMATION**

### **§ 6.1 Contractor's Qualification Statement**

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

### **§ 6.2 Owner's Financial Capability**

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

### **§ 6.3 Submittals**

**§ 6.3.1** After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

**§ 6.3.2** The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

**§ 6.3.3** Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

**§ 6.3.4** Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

## ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

### § 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.

*(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)*

<< >>

### § 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

## ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

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

<< >>

- .5 Drawings

Number

Title

Date

Coaledo Hall Renovation  
Drawings

March 3, 2023

March 3, 2023

.6 Specifications

Section	Title	Date	Pages

.7 Addenda:

Number	Date	Pages

.8 Other Exhibits:

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

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

« »

[ ☐ » ] The Sustainability Plan:

Title	Date	Pages

[ ☐ » ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents listed below:

*(List here any additional documents that are intended to form part of the Proposed Contract Documents.)*

« »

SECTION 00 22 10 – SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

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 The following supplements shall modify, change, delete from or add to the aia document a701-1997 instructions to bidders. Where any article of the instructions to bidders is modified or any paragraph, subparagraph, or clause thereof is modified or deleted by these supplements, the unaltered provisions of that article, paragraph, subparagraph, or clause shall remain in effect.

- A. Article 1 Definitions add to as follows:

1. The word Owner is SOUTHWESTERN OREGON COMMUNITY COLLEGE.
2. The word Architect is OPSIS ARCHITECTURE LLP.

- B. Article 4 Bidding Procedure Subparagraph 4.1.1, add the following:

1. One copy of the Bid Form and other required bidding documents shall be submitted with all blank spaces in the form fully filled.
2. Preparation of first-tier subcontractor disclosure.
  - a. Per ORS 279C.370 the Bidder shall submit First-Tier Subcontractor Disclosure Form not later than 2 hours following the Bid Closing, or the bid will be rejected.
  - b. To determine disclosure requirements, the Agency recommends that you disclose subcontract information for any subcontractor and supplier as follows:
    - 1) Determine the lowest possible contract price. That price will be the base bid amount less all alternate deductive bid amounts (exclusive of any options that can only be exercised after contract award).
    - 2) Provide the required disclosure information for any first-tier subcontractor whose potential contract services (i.e., subcontractor's base bid amount plus all alternate additive bid amounts, exclusive of any options that can only be exercised after contract award) are greater than or equal to: (i) 5% of that lowest contract price, but at least \$15,000, or (ii) \$350,000 regardless of the percentage. Total all possible work for each subcontractor in making this determination (e.g., if a subcontractor will provide \$15,000 worth of services on the base bid and \$40,000 on an additive alternate, then the potential amount of subcontractor's services is \$55,000. Assuming that \$55,000 exceeds 5% of the lowest contract price, provide the disclosure for both the \$15,000 services and the \$40,000 services).
    - 3) Submission. A Bidder shall submit the disclosure form required by this rule within two (2) working hours of Bid Closing in the manner specified by the ITB.
    - 4) Responsiveness. Compliance with the disclosure and submittal requirements of ORS 279C.370 and this rule is a matter of Responsiveness. Bids which are submitted by Bid Closing, but for which the separate disclosure submittal has not been made by the specified deadline, are not Responsive and shall not be considered for Contract award.
    - 5) Substitution. Substitution of affected first-tier subcontractors shall be made only in accordance with ORS 279C.585. Agencies do not have a statutory role or duty to review, approve, or resolve disputes concerning such

substitutions. However, Agencies are not precluded from making related inquiries or investigating complaints in order to enforce Contract provisions that require compliance generally with laws, rules and regulations.

- 6) Effective Date. This rule shall apply to Public Improvement Contract first advertised on or after August 1, 2003. The above instructions have been amended to include modifications approved by the 2005 legislature.

- 7) Article 4 Bidding Procedure Subparagraph 4.2.2, add the following:

- C. Bid security in the form of Bid Bond issued by a Bonding Company acceptable to the Owner, cashier's check or certified check in an amount equal to 10% of the total bid, made payable to the Owner shall be required.

1.3 ARTICLE 4 BIDDING PROCEDURE SUBPARAGRAPH 4.2.3, ADD THE FOLLOWING:

- A. All Bidders will leave their bids open for a period of thirty (30) days after the date of bid opening. No bid may be withdrawn during such period of time. Owner may accept any Bid in accordance with the Instructions to Bidders within such thirty (30) day period.

1.4 ARTICLE 5 CONSIDERATION OF BIDS ADD SUBPARAGRAPH 5.3.3:

- A. If the Contractor is to be awarded, Owner will provide written Notice of Intent to Award to all Bidders of the Owner's intent to award the Contract. Owner's award shall not be final until the later of the following:
  1. Five (5) days after the date of the Notice of Intent; or
  2. The Owner provides a written response to all timely-filed protests that denies the protest and affirms the award.

1.5 ARTICLE 5 CONSIDERATION OF BIDS ADD SUBPARAGRAPH 5.3.4:

- A. Goods or services manufactured or produced in the State of Oregon to receive preference, all factors being equal.

1.6 ARTICLE 6 POST BID INFORMATION DELETE SUBPARAGRAPH 6.1:

- A. Contractor's Qualification Statement.

1.7 ARTICLE 7 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND SUBPARAGRAPH 7.2.2:

- A. A Performance Bond and Labor and Material Payment Bond shall be required. Contractor shall provide separate Performance Bond and Labor and Material Payment Bond made payable to the Owner issued by a Corporation legally licensed to transact business in the State of Oregon. Corporation issuing such a bond must comply with applicable Oregon Statutes for public work and be satisfactory to the Owner. The bonds are to be in the amount of 100% of the contract sum to assure the Owner of full and prompt performance of the Contract.

1.8 ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR SUBPARAGRAPH 8.1.1 ADD THE FOLLOWING:

- A. The Contractor shall within ten (10) days after notification in writing of the Owner's Notice to award a Contract, execute and return to the Owner the Form of Agreement, the Bonds and all applicable Certificates of Insurance.

1.9 LIQUIDATED DAMAGES:

- A. It is understood that unless extended in accordance with "The General Conditions of the Contract for Construction" that the Contractor will pay as liquidated damages to the Owner for any delay



beyond the Substantial Completion Date established by the Contract the sum of \$300.00 per calendar day, for each day required beyond that date. Refer to Supplementary General Conditions, Article 8 for additional information regarding liquidated damages.

1.10 NOTICE OF SPECIAL CONDITIONS:

- A. Federal Participation Disclosure: This project will be partially funded with Federal funds from the United States Department of Commerce, Economic Development Administration and therefore is subject to the Federal laws and regulations associated with that program.
- B. Laws and Regulations: Bidder's attention is directed to the following requirements imposed on federally-assisted construction projects by specific laws enacted by Congress, Presidential Executive Orders, or Departmental Policy. Such standards include (but are not limited to) the following, as applicable:
  - 1. The project will also meet all applicable program standards, State codes, and local codes and ordinances.
  - 2. Current prevailing Davis-Bacon wage rate determination or Oregon BOLI Prevailing Wage Rates, whichever is higher.
  - 3. Economic Development Administration (EDA) Contracting Provisions for Construction Projects.
  - 4. EDA Notice of Requirements for Affirmative Action.
  - 5. Lobbying Restriction (Form CD-512).

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

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SECTION 00 41 00 – BID FORM

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.

PART 2 - THE PROJECT AND THE PARTIES

2.1 TO:

- A. Owner: SOUTHWESTERN OREGON COMMUNITY COLLEGE (SWOCC).  
1. Attn: Jeff Whitey, VP for Administrative Services.  
2. Address: 1988 Newmark Avenue, Coos Bay, Oregon 97420.

2.2 FOR: SWOCC COALEDO HALL AND SUMNER HALL RENOVATIONS.

2.3 DATE: 5/18/2023 (BIDDER TO ENTER DATE).

2.4 SUBMITTED BY:

2.5 NAME OF FIRM (PLEASE PRINT): Scott Partney Construction, Inc.

2.6 GENERAL

- A. The Bidder declares that they have carefully examined the Contract Documents for the construction of the proposed improvements; that the Bidder has personally inspected the contemplated construction area, that the Bidder has satisfied themselves as to the quantities of materials, items of equipment, possible difficulties, and conditions of work involved.
- B. By signing this Proposal, Bidder certifies that he will comply with the provisions of 40 U.S.C. 276a and ORS 279C.840 relating to Davis-Bacon Act or Prevailing Wages, whichever is higher.
- C. The bidder further declares that they are registered with the Construction Contractor's Board as required by ORS 701.35 to 701.55, and possess such additional licenses and certifications as required by law for the performance of the work proposed herein.
- D. The subcontractor(s) performing work as described in ORS 701.005(2) will be registered with the Construction Contractors Board in accordance with ORS 701.035 to 701.055 before the subcontractor(s) commence work under the Contract.
- E. Pursuant to ORS 279A.120, Bidder hereby certifies the Bidder X is / \_\_\_\_\_ is not (check one) a Resident Bidder as defined by ORS 279.029.
- F. Bidder certifies that the provisions required by ORS 279C.836, unless exempt under Sections (4), (7), (8), or (9), before starting work on this Contract, or any subcontract hereunder, Contractor and all subcontractors shall have on file with the Construction Contractor's Board a public works bond with corporate surety authorized to do business in the State of Oregon in the amount of \$10,000.
- G. The Bidder agrees that if this Proposal is accepted, the Bidder will, within ten (10) calendar days after receiving contract forms, execute the Agreement between Owner and Contractor as specified, and deliver to the Owner the Performance and Labor and Payment Bonds required herein.

2.7 BIDS:

- A. The undersigned bidder, in submitting his bid, authorizes the Owner to evaluate the bid and make a single award per Bid Schedule, on the basis of the bid.
- B. After having examined all of the contract documents as prepared by OPSIS ARCHITECTURE LLP, we do hereby propose to furnish labor and materials to complete the work required by said documents for the following fixed sum (fill in lump sum amount for each bid unit, in written words in space provided, and in numerals within parenthesis):
- C. BASIC BID: SWOCC COALEDO HALL AND SUMNER HALL RENOVATIONS as described in the Construction Documents:
- D. Four Million Six Hundred Sixty One Thousand Five Hundred Thirty NineDollars.
- E. and zero Cents (\$ 4,661,539.00 ) complete.
- F. Bidder further agrees to be bound by the entire Contract Documents, including:
  - 1. Bid Solicitation
  - 2. Issued Addenda
  - 3. Instructions to Bidders - AIA A701 and Supplemental Instructions to Bidders
  - 4. Bid Form (this document)
  - 5. Subcontractor Disclosure Form
  - 6. General Conditions - AIA 201 and Supplementary Conditions
  - 7. Contract for Construction: Owner-Contractor Agreement - AIA 101
  - 8. Performance and Payment Bonds
  - 9. Technical Specifications (within Drawings)
  - 10. Plans/Drawings
  - 11. Issued Change Orders and Architects Supplemental Instructions
  - 12. All Applicable State and Federal Laws
  - 13. This project will be partially funded with Federal funds from the United States Department of Commerce, Economic Development Administration and therefore is subject to the Federal laws and regulations.

2.8 BID SECURITY

- A. Bid security in the form of a certified check of Bid Bond in the amount of 10% of the bid amount is enclosed per ORS 279C.385. The undersigned agrees that Bid Security will be left in escrow with the Owner and that the amount thereof is the measure of liquidated damages which Owner will sustain by failure of the undersigned to deliver and execute the Contract or provide Performance and Payment Bonds and may become the property of the Owner at Owner's option. If this bid is not accepted within thirty (30) days of the time set for the opening of bids or if the undersigned executes and timely delivers said contract and the Performance and Payment Bonds, the Bid Security will be returned.

2.9 LOBBYING CERTIFICATION AND RESTRICTION FORM (CD-512)

- A. Bidder shall enclose a completed Lobbying Certification and Restriction Form. Form CD-512 is found immediately following this Bid Form.

2.10 COMPLETION DATE AND LIQUIDATED DAMAGES

- A. It is understood that time is of the essence in the execution of this Contract in order to avoid undue hardship upon the Owner. It is the desire of the Owner to issue a Notice to Proceed upon successful review of the lower qualified bidder and have the Sumner Hall completed within One hundred fifty-one ( ~~151~~ ) calendar days and Coaledo Hall completed within Two hundred forty-three ( ~~243~~ ) calendar days. (180) Sumner / (270) Coaledo
- B. The Undersigned agrees to have the work Substantially Complete on or before One hundred fifty-one ( ~~151~~ ) calendar days for Sumner Hall and Two hundred forty-three ( ~~243~~ ) calendar days for Coaledo Hall after Notice to Proceed (*Contractor to fill in number of days he/she will require to perform the Work and this will be the agreed upon construction time period*).
- C. The Contractor agrees that said Work shall be prosecuted regularly, diligently, at such rate of progress as will insure Substantial Completion thereof within the time specified. It is expressly understood and agreed, by the Contractor and the Owner, that the time for the completion of the Work described herein is reasonable taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.
- D. If said contractor shall neglect, fail or refuse to coordinate the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner the sum of THREE HUNDRED DOLLARS (\$300), not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the contractor shall be in default after the time stipulated in the contract for substantial completion of the work.

2.11 OWNER RIGHTS

- A. The Owner reserves the right to reject any or all bids and to waive all informalities.

2.12 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.

B.

1. Addendum # 1 Dated 4/24/2023.
2. Addendum # 2 Dated 5/8/2023.
3. Addendum # 3 Dated 5/9/2023.
4. Addendum # 4 5/10/2023

2.13 BIDDER DATA AND SIGNATURE(S)

- A. Name of Firm (please print):  
Scott Partney Construction, Inc.
- B. Mailing Address:  
598 Chappell Parkway, North Bend, OR 97459
- C. Physical Address (if different):  
\_\_\_\_\_
- D. Construction Contractor Board Registration Number:  
162882
- E. Telephone Number:  
541-756-7060
- F. Fax Number:  
541-756-7067

\_\_\_\_\_.

G. Email Address:

spartney@partneyconstruction.net

\_\_\_\_\_.

H. Signature (if bid is by a partnership, one of the partners must sign):

\_\_\_\_\_.

Scott O. Partney, President

I. Name and Official Capacity of Signatory (*please print*):

\_\_\_\_\_.

J. If Corporation, Attest (Secretary of Corporation):

\_\_\_\_\_.

K. SEAL (if Corporation):

END OF BID FORM

SECTION 00 43 25 - SUBSTITUTION REQUEST FORM DURING PROCUREMENT

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. Forms:

- a. Substitution Request Form (During Procurement): Use attached form or its equivalent.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

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SECTION 00 52 00 – AGREEMENT FORM

PART 1 - GENERAL

1.1 FORM OF AGREEMENT

- A. The agreement to be executed is attached following this page.

1.2 RELATED REQUIREMENTS

- A. Section 00 72 00 "General Conditions."
- B. Section 00 73 00 "Supplementary Conditions."

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

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

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

«Southwestern Oregon Community College »« »  
«1988 Newmark Avenue »  
«Coos Bay, Oregon »  
«97420 »

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

«To be determined. »« »  
« »  
« »  
« »

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

«Southwestern Oregon Community College »  
«Coaledo Hall and Sumner Hall Renovations »  
« »

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

«Opsis Architecture, LLP »« »  
«920 NW 17<sup>th</sup> Avenue »  
«Portland, Oregon »  
«97209 »

The Owner and Contractor agree as follows.

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

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

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

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

## TABLE OF ARTICLES

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

## EXHIBIT A INSURANCE AND BONDS

### ARTICLE 1 THE CONTRACT DOCUMENTS

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

### ARTICLE 2 THE WORK OF THIS CONTRACT

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

### ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

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

*(Check one of the following boxes.)*

[ ☐ ] The date of this Agreement.

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

[ ☐ ] Established as follows:

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

<< >>

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

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

#### § 3.3 Substantial Completion

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

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

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

[ « » ] By the following date: « »

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

Portion of Work	Substantial Completion Date

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

#### ARTICLE 4 CONTRACT SUM

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

#### § 4.2 Alternates

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

Item	Price

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

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:

(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:

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

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

§ 4.5 Liquidated damages, if any:

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

« »

§ 4.6 Other:

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

« »

## ARTICLE 5 PAYMENTS

### § 5.1 Progress Payments

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

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

« »

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

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

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

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

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

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

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

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

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

### § 5.1.7 Retainage

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

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

« »

§ 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.)

<< >>

§ 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.)

<< >>

§ 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.)

<< >>

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

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

## § 5.2 Final Payment

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

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

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

<< >>

## § 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.)

<< >> % << >>

## ARTICLE 6 DISPUTE RESOLUTION

### § 6.1 Initial Decision Maker

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

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

<< >>

<< >>

<< >>  
<< >>

## § 6.2 Binding Dispute Resolution

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

(Check the appropriate box.)

☐ [ << >> ] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

☐ [ << >> ] Litigation in a court of competent jurisdiction

☐ [ << >> ] Other (Specify)

<< >>

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

## ARTICLE 7 TERMINATION OR SUSPENSION

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

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

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

<< >>

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

## ARTICLE 8 MISCELLANEOUS PROVISIONS

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

§ 8.2 The Owner’s representative:

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

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

§ 8.3 The Contractor’s representative:

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

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



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

#### § 8.5 Insurance and Bonds

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

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

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

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

<< >>

§ 8.7 Other provisions:

<< >>

### ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

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

*(Insert the date of the E203-2013 incorporated into this Agreement.)*

<< >>

- .5 Drawings

Number	Title	Date

- .6 Specifications

Section	Title	Date	Pages

- .7 Addenda, if any:

Number	Date	Pages

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

- .8 Other Exhibits:

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

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

« »

[ « » ] The Sustainability Plan:

Title	Date	Pages

[ « » ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

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

« »

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

OWNER (Signature)

« »« »

(Printed name and title)

CONTRACTOR (Signature)

« »« »

(Printed name and title)

SECTION 00 72 00 - FORM OF GENERAL CONDITIONS

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 THE GENERAL CONDITIONS APPLICABLE TO THIS CONTRACT IS ATTACHED FOLLOWING THIS PAGE:

- A. AIA Document A201-2007, General Conditions of the Contract for Construction.

PART 2 - SUPPLEMENTARY CONDITIONS

- 2.1 Refer to document 00 73 00 "Supplementary Conditions" for amendments to these general conditions.

PART 3 - EXECUTION

*NOT USED*

END OF SECTION

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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)

«Southwestern Oregon Community College »  
«Coaledo Hall and Sumner Hall Renovations »

**THE OWNER:**

(Name, legal status and address)

«Southwestern Oregon Community College »« »  
«1988 Newmark Avenue  
Coos Bay, Oregon  
97420 »

**THE ARCHITECT:**

(Name, legal status and address)

«Opsis Architecture, LLP »« »  
«920 NW 17<sup>th</sup> Avenue  
Portland, Oregon  
97209 »

### TABLE OF ARTICLES

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

### 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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- 14 TERMINATION OR SUSPENSION OF THE CONTRACT
- 15 CLAIMS AND DISPUTES



## INDEX

(Topics and numbers in bold are Section headings.)

### Acceptance of Nonconforming Work

9.6.6, 9.9.3, **12.3**

Acceptance of Work

9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, **12.3**

### Access to Work

**3.16**, 6.2.1, **12.1**

Accident Prevention

10

Acts and Omissions

3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5,  
10.2.8, 13.3.2, 14.1, 15.1.2, 15.2

Addenda

1.1.1

Additional Costs, Claims for

3.7.4, 3.7.5, 10.3.2, 15.1.5

### Additional Inspections and Testing

9.4.2, 9.8.3, 12.2.1, **13.4**

### Additional Time, Claims for

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

### Administration of the Contract

3.1.3, **4.2**, 9.4, 9.5

Advertisement or Invitation to Bid

1.1.1

Aesthetic Effect

4.2.13

### Allowances

**3.8**

### Applications for Payment

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

Approvals

2.1.1, 2.3.1, 2.5, 3.1.3, 3.10.2, 3.12.8, 3.12.9,  
3.12.10.1, 4.2.7, 9.3.2, 13.4.1

### Arbitration

8.3.1, 15.3.2, **15.4**

## ARCHITECT

**4**

Architect, Definition of

**4.1.1**

Architect, Extent of Authority

2.5, 3.12.7, 4.1.2, 4.2, 5.2, 6.3, 7.1.2, 7.3.4, 7.4, 9.2,  
9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1,  
13.4.1, 13.4.2, 14.2.2, 14.2.4, 15.1.4, 15.2.1

Architect, Limitations of Authority and  
Responsibility

2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2,  
4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4,  
9.4.2, 9.5.4, 9.6.4, 15.1.4, 15.2

Architect's Additional Services and Expenses

2.5, 12.2.1, 13.4.2, 13.4.3, 14.2.4

Architect's Administration of the Contract

3.1.3, 3.7.4, 15.2, 9.4.1, 9.5

Architect's Approvals

2.5, 3.1.3, 3.5, 3.10.2, 4.2.7

Architect's Authority to Reject Work

3.5, 4.2.6, 12.1.2, 12.2.1

Architect's Copyright

1.1.7, 1.5

Architect's Decisions

3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3,  
7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1,  
13.4.2, 15.2

Architect's Inspections

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

Architect's Instructions

3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.4.2

Architect's Interpretations

4.2.11, 4.2.12

Architect's Project Representative

4.2.10

Architect's Relationship with Contractor

1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2,  
3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16,  
3.18, 4.1.2, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5,  
9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.3.2, 13.4, 15.2

Architect's Relationship with Subcontractors

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

Architect's Representations

9.4.2, 9.5.1, 9.10.1

Architect's Site Visits

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

Asbestos

10.3.1

Attorneys' Fees

3.18.1, 9.6.8, 9.10.2, 10.3.3

Award of Separate Contracts

6.1.1, 6.1.2

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

**5.2**

### Basic Definitions

**1.1**

Bidding Requirements

1.1.1

Binding Dispute Resolution

8.3.1, 9.7, 11.5, 13.1, 15.1.2, 15.1.3, 15.2.1, 15.2.5,  
15.2.6.1, 15.3.1, 15.3.2, 15.3.3, 15.4.1

Bonds, Lien

7.3.4.4, 9.6.8, 9.10.2, 9.10.3

### Bonds, Performance, and Payment

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

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

Building Permit

3.7.1

### Capitalization

**1.3**

Certificate of Substantial Completion

9.8.3, 9.8.4, 9.8.5

## **Certificates for Payment**

4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.4

Certificates of Inspection, Testing or Approval  
13.4.4

Certificates of Insurance  
9.10.2

## **Change Orders**

1.1.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.7, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.2, 11.5, 12.1.2

**Change Orders**, Definition of

### **7.2.1**

## **CHANGES IN THE WORK**

2.2.2, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1, 11.5

**Claims**, Definition of

### **15.1.1**

Claims, Notice of  
1.6.2, 15.1.3

## **CLAIMS AND DISPUTES**

3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, **15**, 15.4  
Claims and Timely Assertion of Claims  
15.4.1

## **Claims for Additional Cost**

3.2.4, 3.3.1, 3.7.4, 7.3.9, 9.5.2, 10.2.5, 10.3.2, **15.1.5**

## **Claims for Additional Time**

3.2.4, 3.3.1, 3.7.4, 6.1.1, 8.3.2, 9.5.2, 10.3.2, **15.1.6**

## **Concealed or Unknown Conditions, Claims for 3.7.4**

Claims for Damages

3.2.4, 3.18, 8.3.3, 9.5.1, 9.6.7, 10.2.5, 10.3.3, 11.3, 11.3.2, 14.2.4, 15.1.7

Claims Subject to Arbitration  
15.4.1

## **Cleaning Up**

**3.15**, 6.3

Commencement of the Work, Conditions Relating to  
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.2, **15.1.5**

**Commencement of the Work**, Definition of  
**8.1.2**

## **Communications**

3.9.1, **4.2.4**

Completion, Conditions Relating to

3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 14.1.2, 15.1.2

## **COMPLETION, PAYMENTS AND 9**

Completion, Substantial

3.10.1, 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 15.1.2

Compliance with Laws

2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3

Concealed or Unknown Conditions

3.7.4, 4.2.8, 8.3.1, 10.3

Conditions of the Contract

1.1.1, 6.1.1, 6.1.4

Consent, Written

3.4.2, 3.14.2, 4.1.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 13.2, 15.4.4.2

## **Consolidation or Joinder**

### **15.4.4**

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

1.1.4, **6**

**Construction Change Directive**, Definition of  
**7.3.1**

## **Construction Change Directives**

1.1.1, 3.4.2, 3.11, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, **7.3**, 9.3.1.1

Construction Schedules, Contractor's

3.10, 3.11, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2

## **Contingent Assignment of Subcontracts**

**5.4**, 14.2.2.2

## **Continuing Contract Performance**

### **15.1.4**

**Contract**, Definition of

### **1.1.2**

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

5.4.1.1, 5.4.2, 11.5, **14**

Contract Administration

3.1.3, 4, 9.4, 9.5

Contract Award and Execution, Conditions Relating to

3.7.1, 3.10, 5.2, 6.1

Contract Documents, Copies Furnished and Use of  
1.5.2, 2.3.6, 5.3

**Contract Documents**, Definition of

### **1.1.1**

## **Contract Sum**

2.2.2, 2.2.4, 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.3, 7.4, **9.1**, 9.2, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.5, 12.1.2, 12.3, 14.2.4, 14.3.2, 15.1.4.2, **15.1.5**, **15.2.5**

**Contract Sum**, Definition of

### **9.1**

Contract Time

1.1.4, 2.2.1, 2.2.2, 3.7.4, 3.7.5, 3.10.2, 5.2.3, 6.1.5, 7.2.1.3, 7.3.1, 7.3.5, 7.3.6, 7, 7.3.10, 7.4, 8.1.1, 8.2.1, 8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 12.1.2, 14.3.2, 15.1.4.2, 15.1.6.1, 15.2.5

**Contract Time**, Definition of  
8.1.1

**CONTRACTOR**

### **3**

Contractor, Definition of

### **3.1**, **6.1.2**

## **Contractor's Construction and Submittal Schedules**

**3.10**, 3.12.1, 3.12.2, 4.2.3, 6.1.3, 15.1.6.2



Contractor's Employees  
2.2.4, 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6,  
10.2, 10.3, 11.3, 14.1, 14.2.1.1

**Contractor's Liability Insurance**  
**11.1**  
Contractor's Relationship with Separate Contractors  
and Owner's Forces  
3.12.5, 3.14.2, 4.2.4, 6, 11.3, 12.2.4  
Contractor's Relationship with Subcontractors  
1.2.2, 2.2.4, 3.3.2, 3.18.1, 3.18.2, 4.2.4, 5, 9.6.2,  
9.6.7, 9.10.2, 11.2, 11.3, 11.4  
Contractor's Relationship with the Architect  
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2,  
3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.2, 5.2,  
6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6,  
10.3, 11.3, 12, 13.4, 15.1.3, 15.2.1  
Contractor's Representations  
3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2  
Contractor's Responsibility for Those Performing the  
Work  
3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8  
Contractor's Review of Contract Documents  
3.2  
Contractor's Right to Stop the Work  
2.2.2, 9.7  
Contractor's Right to Terminate the Contract  
14.1  
Contractor's Submittals  
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2,  
9.8.3, 9.9.1, 9.10.2, 9.10.3  
Contractor's Superintendent  
3.9, 10.2.6  
Contractor's Supervision and Construction  
Procedures  
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4,  
7.1.3, 7.3.4, 7.3.6, 8.2, 10, 12, 14, 15.1.4  
Coordination and Correlation  
1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1  
Copies Furnished of Drawings and Specifications  
1.5, 2.3.6, 3.11  
Copyrights  
1.5, **3.17**  
Correction of Work  
2.5, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**, 12.3,  
15.1.3.1, 15.1.3.2, 15.2.1  
**Correlation and Intent of the Contract Documents**  
**1.2**  
**Cost**, Definition of  
**7.3.4**  
Costs  
2.5, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3,  
7.3.3.3, 7.3.4, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6,  
11.2, 12.1.2, 12.2.1, 12.2.4, 13.4, 14  
**Cutting and Patching**  
**3.14**, 6.2.5

Damage to Construction of Owner or Separate  
Contractors  
3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 12.2.4  
Damage to the Work  
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 12.2.4  
Damages, Claims for  
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.3.2,  
11.3, 14.2.4, 15.1.7  
Damages for Delay  
6.2.3, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 14.3.2  
**Date of Commencement of the Work**, Definition of  
**8.1.2**  
**Date of Substantial Completion**, Definition of  
**8.1.3**  
**Day**, Definition of  
**8.1.4**  
Decisions of the Architect  
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 6.3, 7.3.4,  
7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.4.2,  
14.2.2, 14.2.4, 15.1, 15.2  
**Decisions to Withhold Certification**  
9.4.1, **9.5**, 9.7, 14.1.1.3  
Defective or Nonconforming Work, Acceptance,  
Rejection and Correction of  
2.5, 3.5, 4.2.6, 6.2.3, 9.5.1, 9.5.3, 9.6.6, 9.8.2, 9.9.3,  
9.10.4, 12.2.1  
Definitions  
1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 5.1,  
6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1  
**Delays and Extensions of Time**  
**3.2**, **3.7.4**, 5.2.3, 7.2.1, 7.3.1, **7.4**, **8.3**, 9.5.1, **9.7**,  
10.3.2, **10.4**, 14.3.2, **15.1.6**, 15.2.5  
**Digital Data Use and Transmission**  
**1.7**  
Disputes  
6.3, 7.3.9, 15.1, 15.2  
**Documents and Samples at the Site**  
**3.11**  
**Drawings**, Definition of  
**1.1.5**  
Drawings and Specifications, Use and Ownership of  
3.11  
Effective Date of Insurance  
8.2.2  
**Emergencies**  
**10.4**, 14.1.1.2, **15.1.5**  
Employees, Contractor's  
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2,  
10.3.3, 11.3, 14.1, 14.2.1.1  
Equipment, Labor, or Materials  
1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,  
4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3,  
9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2  
Execution and Progress of the Work  
1.1.3, 1.2.1, 1.2.2, 2.3.4, 2.3.6, 3.1, 3.3.1, 3.4.1, 3.7.1,  
3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.6, 8.2, 9.5.1,  
9.9.1, 10.2, 10.3, 12.1, 12.2, 14.2, 14.3.1, 15.1.4

Extensions of Time  
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2,  
10.4, 14.3, 15.1.6, **15.2.5**  
**Failure of Payment**  
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2  
Faulty Work  
(See Defective or Nonconforming Work)  
**Final Completion and Final Payment**  
4.2.1, 4.2.9, 9.8.2, **9.10**, 12.3, 14.2.4, 14.4.3  
Financial Arrangements, Owner's  
2.2.1, 13.2.2, 14.1.1.4  
**GENERAL PROVISIONS**  
**1**  
**Governing Law**  
**13.1**  
Guarantees (See Warranty)  
**Hazardous Materials and Substances**  
10.2.4, **10.3**  
Identification of Subcontractors and Suppliers  
5.2.1  
**Indemnification**  
3.17, **3.18**, 9.6.8, 9.10.2, 10.3.3, 11.3  
**Information and Services Required of the Owner**  
2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10.1, 6.1.3, 6.1.4, 6.2.5,  
9.6.1, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2,  
14.1.1.4, 14.1.4, 15.1.4  
**Initial Decision**  
**15.2**  
**Initial Decision Maker, Definition of**  
1.1.8  
Initial Decision Maker, Decisions  
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5  
Initial Decision Maker, Extent of Authority  
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5  
**Injury or Damage to Person or Property**  
**10.2.8**, 10.4  
Inspections  
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3,  
9.9.2, 9.10.1, 12.2.1, 13.4  
Instructions to Bidders  
1.1.1  
Instructions to the Contractor  
3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.4.2  
**Instruments of Service, Definition of**  
**1.1.7**  
Insurance  
6.1.1, 7.3.4, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5,  
**11**  
Insurance, Notice of Cancellation or Expiration  
11.1.4, 11.2.3  
**Insurance, Contractor's Liability**  
**11.1**  
Insurance, Effective Date of  
8.2.2, 14.4.2  
**Insurance, Owner's Liability**  
**11.2**

**Insurance, Property**  
**10.2.5**, 11.2, 11.4, 11.5  
Insurance, Stored Materials  
9.3.2  
**INSURANCE AND BONDS**  
**11**  
Insurance Companies, Consent to Partial Occupancy  
9.9.1  
Insured loss, Adjustment and Settlement of  
11.5  
Intent of the Contract Documents  
1.2.1, 4.2.7, 4.2.12, 4.2.13  
**Interest**  
**13.5**  
**Interpretation**  
1.1.8, 1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1  
Interpretations, Written  
4.2.11, 4.2.12  
Judgment on Final Award  
15.4.2  
**Labor and Materials, Equipment**  
1.1.3, 1.1.6, **3.4**, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,  
5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1,  
10.2.4, 14.2.1.1, 14.2.1.2  
Labor Disputes  
8.3.1  
Laws and Regulations  
1.5, 2.3.2, 3.2.3, 3.2.4, 3.6, 3.7, 3.12.10, 3.13, 9.6.4,  
9.9.1, 10.2.2, 13.1, 13.3.1, 13.4.2, 13.5, 14, 15.2.8,  
15.4  
Liens  
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8  
Limitations, Statutes of  
12.2.5, 15.1.2, 15.4.1.1  
Limitations of Liability  
3.2.2, 3.5, 3.12.10, 3.12.10.1, 3.17, 3.18.1, 4.2.6,  
4.2.7, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.6.8, 10.2.5, 10.3.3,  
11.3, 12.2.5, 13.3.1  
Limitations of Time  
2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7,  
5.2, 5.3, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3,  
9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15,  
15.1.2, 15.1.3, 15.1.5  
**Materials, Hazardous**  
**10.2.4**, **10.3**  
Materials, Labor, Equipment and  
1.1.3, 1.1.6, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,  
5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2,  
10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2  
Means, Methods, Techniques, Sequences and  
Procedures of Construction  
3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2  
Mechanic's Lien  
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8  
**Mediation**  
8.3.1, 15.1.3.2, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1,  
15.4.1.1

## **Minor Changes in the Work**

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

## **MISCELLANEOUS PROVISIONS**

### **13**

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

##### **1.1.1**

#### **Modifications to the Contract**

1.1.1, 1.1.2, 2.5, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7, 10.3.2

#### **Mutual Responsibility**

##### **6.2**

#### **Nonconforming Work, Acceptance of**

9.6.6, 9.9.3, **12.3**

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

#### **Notice**

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

#### **Notice of Cancellation or Expiration of Insurance**

11.1.4, 11.2.3

#### **Notice of Claims**

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

#### **Notice of Testing and Inspections**

13.4.1, 13.4.2

#### **Observations, Contractor's**

3.2, 3.7.4

#### **Occupancy**

2.3.1, 9.6.6, 9.8

#### **Orders, Written**

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

## **OWNER**

### **2**

#### **Owner, Definition of**

##### **2.1.1**

#### **Owner, Evidence of Financial Arrangements**

**2.2**, 13.2.2, 14.1.1.4

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

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

#### **Owner's Authority**

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

#### **Owner's Insurance**

##### **11.2**

#### **Owner's Relationship with Subcontractors**

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

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

**2.5**, 14.2.2

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

### **6.3**

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

### **6.1**

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

### **2.4**

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

14.3

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

14.2, 14.4

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

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

## **Partial Occupancy or Use**

9.6.6, **9.9**

## **Patching, Cutting and**

**3.14**, 6.2.5

#### **Patents**

3.17

#### **Payment, Applications for**

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

#### **Payment, Certificates for**

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

#### **Payment, Failure of**

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

#### **Payment, Final**

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

#### **Payment Bond, Performance Bond and**

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**

#### **Payments, Progress**

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

## **PAYMENTS AND COMPLETION**

### **9**

#### **Payments to Subcontractors**

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

#### **PCB**

10.3.1

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

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**

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

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

## **PERSONS AND PROPERTY, PROTECTION OF**

### **10**

#### **Polychlorinated Biphenyl**

10.3.1

#### **Product Data, Definition of**

##### **3.12.2**

#### **Product Data and Samples, Shop Drawings**

3.11, **3.12**, 4.2.7

## **Progress and Completion**

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

## **Progress Payments**

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

## **Project, Definition of**

### **1.1.4**

Project Representatives

4.2.10

## **Property Insurance**

10.2.5, **11.2**

## **Proposal Requirements**

1.1.1

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

### **Regulations and Laws**

1.5, 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14, 15.2.8, 15.4

### **Rejection of Work**

4.2.6, 12.2.1

### **Releases and Waivers of Liens**

9.3.1, 9.10.2

### **Representations**

3.2.1, 3.5, 3.12.6, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.10.1

### **Representatives**

2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.10, 13.2.1

### **Responsibility for Those Performing the Work**

3.3.2, 3.18, 4.2.2, 4.2.3, 5.3, 6.1.3, 6.2, 6.3, 9.5.1, 10

### **Retainage**

9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3

## **Review of Contract Documents and Field**

### **Conditions by Contractor**

**3.2**, 3.12.7, 6.1.3

### **Review of Contractor's Submittals by Owner and Architect**

3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2

### **Review of Shop Drawings, Product Data and**

Samples by Contractor

3.12

## **Rights and Remedies**

1.1.2, 2.4, 2.5, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.1, 12.2.2, 12.2.4, **13.3**, 14, 15.4

## **Royalties, Patents and Copyrights**

### **3.17**

### **Rules and Notices for Arbitration**

15.4.1

## **Safety of Persons and Property**

**10.2**, 10.4

## **Safety Precautions and Programs**

3.3.1, 4.2.2, 4.2.7, 5.3, **10.1**, 10.2, 10.4

## **Samples, Definition of**

**3.12.3**

## **Samples, Shop Drawings, Product Data and**

3.11, **3.12**, 4.2.7

## **Samples at the Site, Documents and**

**3.11**

## **Schedule of Values**

**9.2**, 9.3.1

### **Schedules, Construction**

3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2

### **Separate Contracts and Contractors**

1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2

## **Separate Contractors, Definition of**

**6.1.1**

### **Shop Drawings, Definition of**

**3.12.1**

### **Shop Drawings, Product Data and Samples**

3.11, **3.12**, 4.2.7

### **Site, Use of**

**3.13**, 6.1.1, 6.2.1

### **Site Inspections**

3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.9.2, 9.4.2, 9.10.1, 13.4

### **Site Visits, Architect's**

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

### **Special Inspections and Testing**

4.2.6, 12.2.1, 13.4

## **Specifications, Definition of**

**1.1.6**

## **Specifications**

1.1.1, **1.1.6**, 1.2.2, 1.5, 3.12.10, 3.17, 4.2.14

### **Statute of Limitations**

15.1.2, 15.4.1.1

### **Stopping the Work**

2.2.2, 2.4, 9.7, 10.3, 14.1

### **Stored Materials**

6.2.1, 9.3.2, 10.2.1.2, 10.2.4

## **Subcontractor, Definition of**

**5.1.1**

## **SUBCONTRACTORS**

**5**

### **Subcontractors, Work by**

1.2.2, 3.3.2, 3.12.1, 3.18, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7

## **Subcontractual Relations**

**5.3**, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1

### **Submittals**

3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.4, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3

### **Submittal Schedule**

3.10.2, 3.12.5, 4.2.7

## **Subrogation, Waivers of**

6.1.1, **11.3**

## **Substances, Hazardous**

**10.3**

## **Substantial Completion**

4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3, 12.2, 15.1.2

## **Substantial Completion, Definition of**

**9.8.1**

### **Substitution of Subcontractors**

5.2.3, 5.2.4

### **Substitution of Architect**

2.3.3

Substitutions of Materials

3.4.2, 3.5, 7.3.8

**Sub-subcontractor**, Definition of

**5.1.2**

Subsurface Conditions

3.7.4

**Successors and Assigns**

**13.2**

**Superintendent**

**3.9**, 10.2.6

**Supervision and Construction Procedures**

1.2.2, **3.3**, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4,

7.1.3, 7.3.4, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.4

Suppliers

1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.5.4, 9.6,

9.10.5, 14.2.1

Surety

5.4.1.2, 9.6.8, 9.8.5, 9.10.2, 9.10.3, 11.1.2, 14.2.2,

15.2.7

Surety, Consent of

9.8.5, 9.10.2, 9.10.3

Surveys

1.1.7, 2.3.4

**Suspension by the Owner for Convenience**

**14.3**

Suspension of the Work

3.7.5, 5.4.2, 14.3

Suspension or Termination of the Contract

5.4.1.1, 14

**Taxes**

3.6, 3.8.2.1, 7.3.4.4

**Termination by the Contractor**

**14.1**, 15.1.7

**Termination by the Owner for Cause**

5.4.1.1, **14.2**, 15.1.7

**Termination by the Owner for Convenience**

**14.4**

Termination of the Architect

2.3.3

Termination of the Contractor Employment

14.2.2

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

**14**

**Tests and Inspections**

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

9.9.2, 9.10.1, 10.3.2, 12.2.1, **13.4**

**TIME**

**8**

**Time, Delays and Extensions of**

3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7,

10.3.2, 10.4, 14.3.2, 15.1.6, 15.2.5

Time Limits

2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2,

5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3,

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

15.1.2, 15.1.3, 15.4

**Time Limits on Claims**

3.7.4, 10.2.8, 15.1.2, 15.1.3

Title to Work

9.3.2, 9.3.3

## **UNCOVERING AND CORRECTION OF WORK**

**12**

**Uncovering of Work**

**12.1**

Unforeseen Conditions, Concealed or Unknown

3.7.4, 8.3.1, 10.3

Unit Prices

7.3.3.2, 9.1.2

Use of Documents

1.1.1, 1.5, 2.3.6, 3.12.6, 5.3

**Use of Site**

**3.13**, 6.1.1, 6.2.1

**Values, Schedule of**

**9.2**, 9.3.1

Waiver of Claims by the Architect

13.3.2

Waiver of Claims by the Contractor

9.10.5, 13.3.2, **15.1.7**

Waiver of Claims by the Owner

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

Waiver of Consequential Damages

14.2.4, 15.1.7

Waiver of Liens

9.3, 9.10.2, 9.10.4

**Waivers of Subrogation**

6.1.1, **11.3**

**Warranty**

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

15.1.2

Weather Delays

8.3, 15.1.6.2

**Work**, Definition of

**1.1.3**

Written Consent

1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.10.3,

13.2, 13.3.2, 15.4.4.2

Written Interpretations

4.2.11, 4.2.12

Written Orders

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

## **ARTICLE 1 GENERAL PROVISIONS**

### **§ 1.1 Basic Definitions**

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

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

#### **§ 1.1.2 The Contract**

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

#### **§ 1.1.3 The Work**

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

#### **§ 1.1.4 The Project**

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

#### **§ 1.1.5 The Drawings**

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

#### **§ 1.1.6 The Specifications**

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

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

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

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

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

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

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

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

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

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

### **§ 1.3 Capitalization**

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

### **§ 1.4 Interpretation**

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

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

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

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

### **§ 1.6 Notice**

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

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

### **§ 1.7 Digital Data Use and Transmission**

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

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

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set

forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

## **ARTICLE 2 OWNER**

### **§ 2.1 General**

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

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

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

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

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

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

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

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

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



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

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

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

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

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

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

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

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

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

### ARTICLE 3 CONTRACTOR

#### § 3.1 General

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

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

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

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

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

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

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

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

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

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

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

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

### **§ 3.4 Labor and Materials**

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

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

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

### **§ 3.5 Warranty**

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

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

### **§ 3.6 Taxes**

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

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

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

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

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

### **§ 3.7.4 Concealed or Unknown Conditions**

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

**§ 3.7.5** If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately

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

### **§ 3.8 Allowances**

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

**§ 3.8.2** Unless otherwise provided in the Contract Documents,

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

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

### **§ 3.9 Superintendent**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

### **§ 3.13 Use of Site**

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

### **§ 3.14 Cutting and Patching**

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

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

### **§ 3.15 Cleaning Up**

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

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

### **§ 3.16 Access to Work**

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

### **§ 3.17 Royalties, Patents and Copyrights**

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

### **§ 3.18 Indemnification**

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

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

## **ARTICLE 4 ARCHITECT**

### **§ 4.1 General**

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

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

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

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

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

**§ 4.2.3** On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not

have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

#### **§ 4.2.4 Communications**

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

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

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

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

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

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

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

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

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



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

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

## **ARTICLE 5 SUBCONTRACTORS**

### **§ 5.1 Definitions**

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

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

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

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

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

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

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

### **§ 5.3 Subcontractual Relations**

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

similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

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

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

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

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

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

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

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

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

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

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

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

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

#### **§ 6.2 Mutual Responsibility**

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

**§ 6.2.2** If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the

Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

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

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

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

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

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

## **ARTICLE 7 CHANGES IN THE WORK**

### **§ 7.1 General**

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

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

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

### **§ 7.2 Change Orders**

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

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

### **§ 7.3 Construction Change Directives**

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

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

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

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;

- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

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

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

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

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

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

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

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

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

#### **§ 7.4 Minor Changes in the Work**

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor

change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

## **ARTICLE 8 TIME**

### **§ 8.1 Definitions**

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

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

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

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

### **§ 8.2 Progress and Completion**

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

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

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

### **§ 8.3 Delays and Extensions of Time**

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

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

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

## **ARTICLE 9 PAYMENTS AND COMPLETION**

### **§ 9.1 Contract Sum**

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

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

### **§ 9.2 Schedule of Values**

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

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

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

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

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

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

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

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

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

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

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

**§ 9.5.1** The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot

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

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

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

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

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

## **§ 9.6 Progress Payments**

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

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

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

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

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

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

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

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

### **§ 9.7 Failure of Payment**

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

### **§ 9.8 Substantial Completion**

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

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

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

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

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



## **§ 9.9 Partial Occupancy or Use**

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

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

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

## **§ 9.10 Final Completion and Final Payment**

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

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

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

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

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

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

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

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

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

### **§ 10.2 Safety of Persons and Property**

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

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

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

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

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

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

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

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

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

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

### **§ 10.3 Hazardous Materials and Substances**

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

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

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

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

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

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

### **§ 10.4 Emergencies**

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

## **ARTICLE 11 INSURANCE AND BONDS**

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

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

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

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

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

### **§ 11.2 Owner's Insurance**

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

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

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

### **§ 11.3 Waivers of Subrogation**

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

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

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

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

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

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

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

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

### **§ 12.1 Uncovering of Work**

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

**§ 12.1.2** If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to

the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

## **§ 12.2 Correction of Work**

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

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

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

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

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

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

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

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

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

## **§ 12.3 Acceptance of Nonconforming Work**

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

## **ARTICLE 13 MISCELLANEOUS PROVISIONS**

### **§ 13.1 Governing Law**

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

## **§ 13.2 Successors and Assigns**

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

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

## **§ 13.3 Rights and Remedies**

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

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

## **§ 13.4 Tests and Inspections**

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

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

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

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

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

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

## **§ 13.5 Interest**

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

## **ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT**

### **§ 14.1 Termination by the Contractor**

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

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

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

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

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

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

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

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

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

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

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

**§ 14.2.4** If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance,



the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

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

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

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

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

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

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

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

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

**§ 14.4.3** In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

### **ARTICLE 15 CLAIMS AND DISPUTES**

#### **§ 15.1 Claims**

##### **§ 15.1.1 Definition**

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

##### **§ 15.1.2 Time Limits on Claims**

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

##### **§ 15.1.3 Notice of Claims**

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

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

#### § 15.1.4 Continuing Contract Performance

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

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

#### § 15.1.5 Claims for Additional Cost

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

#### § 15.1.6 Claims for Additional Time

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

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

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

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

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

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

#### § 15.2 Initial Decision

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

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

Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

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

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

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

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

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

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

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

### **§ 15.3 Mediation**

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

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

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

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

## § 15.4 Arbitration

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

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

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

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

## § 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

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

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

SECTION 00 73 00 – SUPPLEMENTARY CONDITIONS

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. These Supplementary Conditions amend and supplement the General Conditions, AIA Document A201-2007 General Conditions of the Contract for Construction defined in Document 00 72 00 and other provisions of the Contract Documents as indicated below. All provisions that are not so amended or supplemented remain in full force and effect.
- B. The terms used in these Supplementary Conditions that are defined in the General Conditions have the meanings assigned to them in the General Conditions.

1.3 MODIFICATIONS TO GENERAL CONDITIONS

A. ARTICLE 1. GENERAL PROVISIONS

- 1. 1.1.1: Revise the first sentence as set forth below:
  - a. The Contract Documents consist of the Conditions of the Contract (General, Supplementary and other Conditions), Contract Forms as bound or referenced, the Drawings, the Specifications, the Details, all Addenda issued prior to execution of the contract and all modifications issued after execution of the Contract.
- 2. 1.2 CORRELATIONS AND INTENT OF THE CONTRACT DOCUMENTS
  - a. 1.2.1 Add the following:
    - 1) If work is required in a manner to make it impossible to produce first class work, or should discrepancies appear among contract documents, request interpretation before proceeding with work. If Contractor fails to make such request, no excuse will thereafter be entertained for failure to carry out work in satisfactory manner.
  - b. 1.2.3: Add the following:
    - 1) Reference to technical society, organization, or body is made in specifications in accordance with the following abbreviations:
      - a) ACI American Concrete Institute
      - b) AIA American Institute of Architects
      - c) AIEE American Institute of Electrical Engineers
      - d) AISC American Institute of Steel Construction
      - e) ASA American Standard Association
      - f) APA American Plywood Association
      - g) ASTM American Society of Testing Materials
      - h) ASME American Society of Mechanical Engineers
      - i) AWI Architectural Woodwork Institute
      - j) AWS American Welding Society Code

- k) CS Commercial Standard
- l) FS Federal Specifications
- m) IBC International Building Code
- n) MIL Military Specifications
- o) NBFU National Board of Fire Underwriters
- p) NBS National Board of Standards
- q) NEC National Electric Code
- r) NEMA National Electrical Manufacturer's Assn.
- s) NFPA National Fire Protection Association
- t) OSHA Occupational Safety and Health Act
- u) UBC Uniform Building Code
- v) UL Underwriters Laboratory
- w) WCLIB West Coast Lumber Inspection Bureau

B. B. ARTICLE 2 OWNER

- 1. 2.1.1 Add the following:
  - a. The Owner is defined as SOUTHWESTERN OREGON COMMUNITY COLLEGE.
- 2. 2.2.5 Substitute the following:
  - a. The Owner through the Architect will furnish to the Contractor \_\_\_\_\_ complete sets of drawings and specifications without charge for use on project. These include sets submitted to Agency having jurisdiction for plans review and building permit. Additional copies may be purchased by Contractor at cost of reproduction.

C. ARTICLE 3 CONTRACTOR

- 1. 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES
  - a. 3.3.1 Add the following:
    - 1) The Contractor will supervise and direct the work and will review with all subcontractors' methods and materials to be used to verify their compliance with all safety standards and laws and be responsible for compliance with same, to insure safe, hazard free conditions for all persons visiting or working on the entire project.
- 2. 3.7 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS
  - a. 3.7.1 Add:
    - 1) The Owner shall pay for the Building Permit Plan Review and Building Permit fees only. The Contractor shall pay all other permit and plan review fees related to his work and his subcontractors, i.e., plumbing, mechanical and electrical. Owner shall pay any system development fees required.
- 3. 3.11 DOCUMENTS AND SAMPLES AT THE SITE, Add the following
  - a. Upon completion of the project transfer all information from the record set of drawings to a clean set of prints and deliver to the Architect. Drawing additions are to be added in contrasting ink and are to be accurate, neat and finished in appearance and show accurate horizontal and vertical dimensions for location of underground work. Drawings must be acceptable to Architect before certification of final payment will be made.

4. 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
  - a. 3.12.5 Add the following:
    - 1) See Section 01 33 00 "Submittal Procedures" for submittal information, requirements, and procedures.
5. 3.15 CLEANING UP
  - a. 3.15.1 Add the following:
    - 1) Upon completion of any portion of the work, promptly remove temporary facilities generated by that portion of the work, including surplus materials, equipment, and machinery if so directed by the Architect or the Owner. Upon completion of the Work, completely remove temporary facilities. Remove stains, spots and smears from all surfaces. Remove all labels. Leave the premises in a "broom clean" condition.
- D. ARTICLE 4 ARCHITECT
  1. 4.1.1 Add the following:
    - a. The Architect is defined as OPSIS Architecture LLP.
- E. ARTICLE 5 SUBCONTRACTORS
  1. 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK
    - a. 5.2.1 Add the following:
      - 1) The list of subcontractors shall be submitted no later than five (5) days after the bid opening.
- F. ARTICLE 7 CHANGES IN THE WORK
  1. 7.2 CHANGE ORDERS
    - a. 7.2.2 Add the following:
      - 1) The cost to the Owner resulting from extra work shall be determined by an agreed price which shall include a percentage for overhead and profit as listed below; or shall be the actual cost of the additional direct labor, materials, and subcontract work involved, plus a percentage for overhead and profit as listed below.
        - a) The percentage shall not exceed 10% to cover both profit and overhead.
      - 2) The credit to the Owner resulting from a deduction of work shall be determined by an agreed price, or the actual cost of direct labor, materials, and subcontract work involved.
      - 3) Cost and credits shall be submitted by the Contractor to the Architect in a complete breakdown form, showing cost, overhead and profit.
      - 4) Cost shall be limited to the following: Cost of products, including taxes and cost of delivery; cost of labor, including social security, old age, and unemployment insurance, and fringe benefits under collective bargaining agreements; Workmen's Compensation Insurance; bond premiums; and rental value of power tools and equipment. Overhead shall include the following: Supervision, superintendence, wages of timekeepers, watchmen, and clerks, hand tools, incidentals, general office expense, and all other proven expenses not included in "cost".
- G. ARTICLE 8 TIME

1. 8.2 PROGRESS AND COMPLETION

a. 8.2.4 Add the following:

- 1) The Contractor agrees:
- 2) To proceed upon receipt of the executed Contract and the Notice to Proceed.
- 3) It is hereby understood and mutually agreed, by and between the contractor and the Owner, that the date of beginning and the time for completion of each phase of the work to be done are ESSENTIAL CONDITIONS of this contract.
- 4) The Contractor agrees that said work shall be prosecuted regularly, diligently, at such rate of progress as will insure substantial completion thereof within the time specified. It is expressly understood and agree, by and between the Contractor and the Owner that the time for the completion of the work described herein is reasonable taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.
- 5) If said Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner, the sum of THREE HUNDRED DOLLARS (\$300), not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the contractor shall be in default after the time stipulated in the contract for substantial completion of the work.
- 6) The said amount is fixed and agreed upon by; and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the number of damages which the Owner would sustain.

H. ARTICLE 9 PAYMENTS AND COMPLETION

1. APPLICATIONS FOR PAYMENT

a. 9.3.1 Add the following:

- 1) Payment request form shall be submitted on AIA G702 Application for Payment supplemented with AIA G703 Continuation Sheet. Forms will be furnished by Architect if requested by Contractor. Contractor may use their own spreadsheet type format, however line items must exactly match AIA line items.

2. PROGRESS PAYMENTS

a. 9.6.1 Amend as follows:

- 1) After the Architect has issued a certificate for payment the Owner will pay the Contractor ninety-five (95%) percent of the value of material and labor worked into the building or stored on the site before the first day of the month less the aggregate of previous payments.
- 2) Payment will be made on or before the fifteenth (15th) day of the month following the date of the application for payment.
- 3) Upon Substantial Completion of the contract the sum sufficient to increase total payment to ninety-five (95%) percent of the contract amount is due. Thirty (30) days thereafter, provided the work then be fully completed and accepted by Architects, balance under the contract is due.

I. ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY



1. 10.2 SAFETY OF PERSONS AND PROPERTY

a. 10.2.2 Add the following:

- 1) Contractors shall comply with all provisions of OAR 437 Division 155 (Hazard Communication). Contractor shall provide Owner, through the Architect, a copy of MSDS (Material Safety Data Sheets) for all chemicals brought onto the site, and shall maintain an inventory on the job site of such chemicals. Such inventory shall be accessible to those who desire access.

J. ARTICLE 11 INSURANCE AND BONDS

1. 11.1 CONTRACTORS LIABILITY INSURANCE

a. 11.1.2 Add the following:

- 1) The Contractor's Commercial General Liability insurance and Automobile Liability insurance shall not be less than the amounts shown below. If Contractor does not have Commercial Umbrella Liability or Excess Liability Insurance coverage, then the Commercial General Liability and Automobile Liability limits must be equal to or exceed the amounts shown below. If the Contractor does have or obtains Commercial Umbrella Liability or Excess Liability coverage and the limits combined with the Commercial General Liability and Automobile Liability coverage do not equal or exceed the amounts shown below, then coverage must be increased to equal or exceed the amounts shown below:
- 2) Worker's Compensation as required by law.
- 3) Bodily Injury Liability - Automobile:
  - a) Each person \$2,000,000
  - b) Each occurrence \$2,000,000
- 4) Bodily Injury Liability - Except Automobile
  - a) Each person \$2,000,000
  - b) Each occurrence \$2,000,000
- 5) Property Damage Liability - Automobile:
  - a) Each occurrence \$2,000,000
- 6) Property Damage Liability - Except Automobile:
  - a) Each occurrence \$2,000,000
- 7) The Contractor will either (1) require each of his subcontractors to procure and maintain during the life of his subcontract, subcontractor's commercial general liability, automobile liability, and property damage liability insurance of the type and in the same amounts as specified in 11.1; or (2) insure the activity of his subcontractors..
- 8) The Contractor, its subcontractors, if any, and all employers working under this Agreement are subject employers under the Oregon Workers' Compensation Law and shall comply with ORS 656.017, which requires them to provide workers' compensation coverage for all their subject workers.

2. 11.3.1 Add the following:

- a. The Contractor is advised that the Owner will furnish "Builder's Risk" Insurance and the Contractor is not required to obtain this insurance.

3. 11.4 PERFORMANCE AND PAYMENT BOND

4. 11.4.1 Substitute the following:
  - a. The Contractor shall furnish a Performance Bond in an amount equal to one hundred (100%) percent of the contract sum as security for the faithful performance of this contract and also a Labor and Material Payment Bond in an amount not less than one hundred (100%) percent of the contract sum as security for the payment of all persons performing labor on the project under this contract. Bond shall be written by a company licensed in the State of Oregon and satisfactory to the Owner.

K. ARTICLE 13 MISCELLANEOUS PROVISIONS

1. 13.1 GOVERNING LAW, Add the following:
  - a. General Contractor and each subcontractor to comply with all Federal, State laws pertaining to Social Security, Unemployment Insurance, Tax Regulations. Make prompt payment to designated agencies.
  - b. Contractor agrees to abide by all Federal and State regulations pertaining to the employment of minority and ethnic groups including all required affirmative action, and further agrees to hold owner harmless on account of all duties and responsibilities imposed on Contractor by the terms of any State or Federal Statute, regulation, or other governmental directive.
2. 13.8 Add the following:
  - a. All labor subject to the provisions of the Davis-Bacon Act (40 U.S.C. 276a) as well as ORS 279C.520 and 279C.830, whichever is higher, which is performed under this contract shall be paid not less than the Davis-Bacon or prevailing rate of wage, whichever is higher, for an hour's work in the same trade or occupation in the locality where such labor is performed.

L. ADD ARTICLE 16 SUPPLEMENTAL PUBLIC CONTRACTING STATUTES

1. Contractor, subcontractor(s) and all persons doing or contracting to do any work shall comply with all provisions of Oregon Public Contracting Laws and regulations, as further specified below.
2. Contractor shall pay promptly, as due, all persons supplying labor or materials for the prosecution of the work provided for in the contract, and shall be responsible for such payment of all persons supplying such labor or material to any Subcontractor.
  - a. ORS 279C.580(3)(a) requires the prime contractor to include a clause in each subcontract requiring contractor to pay the first-tier subcontractor for satisfactory performance under its subcontract within ten (10) days out of such amounts as are paid to the prime contractor by the public contracting agency; and
  - b. ORS 279C.580(3)(b) requires the prime contractor to include a clause in each subcontract requiring contractor to pay an interest penalty to the first-tier subcontractor if payment is not made within thirty (30) days after receipt of payment from the public contracting agency.
  - c. ORS 279C.580(4) requires the prime contractor to include in every subcontract a requirement that the payment and interest penalty clauses required by ORS 279C.580(3)(a) and (b) be included in every contract between a subcontractor and a lower-tier subcontractor or supplier.
3. Contractor shall promptly pay all contributions or amounts due the Industrial Accident Fund from such Contractor or Subcontractor incurred in the performance of the contract, and shall be responsible that all sums due the State Unemployment Compensation Fund from Contractor or any Subcontractor in connection with the performance of the contract shall promptly be paid.

4. Contractor shall not permit any lien or claim to be filed or prosecuted against the public contracting agency on account of any labor or material furnished and agrees to assume responsibility for satisfaction of any such lien so filed or prosecuted.
5. A notice of claim on contractor's payment bond shall be submitted only in accordance with ORS 279C.600 and 279C.605.
6. Contractor and any Subcontractor shall pay to the Department of Revenue all sums withheld from employees pursuant to ORS 316.167.
7. Contractor shall demonstrate to the Public Contracting Agency that an employee drug-testing program is in place within ten (10) days of receiving a Notice of Award.
8. If Contractor fails, neglects or refuses to make prompt payment of any claim for labor or materials furnished to the Contractor or a Subcontractor by any person in connection with the contract as such claim becomes due, the public contracting agency may pay such claim to the persons furnishing the labor or material and charge the amount of payment against funds due or to become due Contractor by reason of the contract. The payment of a claim in the manner authorized hereby shall not relieve the Contractor or his surety from his or its obligation with respect to any unpaid claim. If the public contracting agency is unable to determine the validity of any claim for labor or material furnished, the public contracting agency may withhold from any current payment due Contractor an amount equal to said claim until its validity is determined and the claim, if valid, is paid.
9. If the Contractor or a first-tier Subcontractor fails, neglects, or refuses to make payment to a person furnishing labor or materials in connection with the public contract for a public improvement within thirty (30) days after receipt of payment from the public contracting agency or contractor, the contractor or first-tier subcontractor shall owe the person the amount due plus interest charges commencing at the end of the ten (10) day period that payment is due under ORS 279C.580(4) and ending upon final payment, unless payment is subject to a good faith dispute as defined in ORS 279C.580. The rate of interest charged to Contractor or first-tier Subcontractor on the amount due shall equal three times the discount rate on ninety (90) day commercial paper in effect at the Federal Reserve Bank in the Federal Reserve District that includes Oregon on the date that is thirty (30) days after the date when payment was received from the public contracting agency or from the Contractor, but the rate of interest shall not exceed thirty (30) percent. The amount of interest may not be waived.
10. If the Contractor or a Subcontractor fails, neglects, or refuses to make payment to a person furnishing labor or materials in connection with the public contract, the person may file a complaint with the Construction Contractor's Board, unless payment is subject to a good faith dispute as defined in ORS 279C.580.
11. Contractor shall promptly, as due, make payment to any person, co-partnership, association, or corporation, furnishing medical, surgical and hospital care or other needed care and attention, incident to sickness or injury, to employees of such Contractor, or all sums which the Contractor agrees to pay for such services and all monies and sums which the Contractor collected or deducted from the wages of employees pursuant to any law, contract or agreement for the purpose of providing or paying for such service.
12. Contractor shall employ no person for more than ten (10) hours in any one day, or forty (40) hours in any one week, except in cases of necessity, emergency, or where public policy absolutely requires it, and in such cases, except in cases of contracts for personal services designated under ORS 279A.055. Contractor shall pay the employee at least time and one-half pay for all overtime in excess of eight (8) hours a day or forty (40) hours in any one week when the work is five (5) consecutive days, Monday through Friday; or for all overtime in excess of ten (10) hours a day or forty (40) hours in any one week when the work week is four (4) consecutive days, Monday through Friday, and for all work performed on Saturday and on any legal holidays as specified in ORS 279C.540.

13. The Contractor must give notice to employees who work on this contract in writing, either at the time of hire or before commencement of work on the contract, or by posting a notice in a location frequented by employees, of the number of hours per day and the days per week that the employees be required to work.
14. The provisions of ORS 279C. 800 to ORS 279C.870 relating to the prevailing wage rates or the Federal Davis-Bacon Act Wage Determination, whichever is higher, will be complied with.
15. Unless exempt under ORS 279C.836(4), (7), (8) or (9), before starting work on this contract, or any subcontract hereunder, contractor and all subcontractors must have on file with the Construction Contractors Board a public works bond with a corporate surety authorized to do business in the state of Oregon in the amount of \$30,000. The bond must provide that the contractor or subcontractor will pay claims ordered by the Bureau of Labor and Industries to workers performing labor upon public works projects. The bond must be a continuing obligation, and the surety's liability for the aggregate of claims that may be payable from the bond may not exceed the penal sum of the bond. The bond must remain in effect continuously until depleted by claims paid under any applicable prevailing wage rate laws, unless the surety sooner cancels the bond. Contractor further certifies that contractor will include in every subcontract or provision requiring a subcontractor to have a public works bond filed with the Construction Contractors Board before starting work on the project, unless exempt under ORS 279C.836(4), (7), (8) or (9).
  - a. Unless exempt under ORS 279C.836(4), (7), (8) or (9), before permitting a subcontractor to start work on this public works project, the contractor shall verify that the subcontractor has filed a public works bond as required under this section or has elected not to file a public works bond under an exemption.
  - b. Unless public contracting agency has been notified of any applicable exemptions under ORS 279C.836(4), (7), (8) or (9), the public works bond requirement above is in addition to any other bond contractors or subcontractors may be required to obtain under this contract.
16. Unless exempt, Contractor or contractor's surety and every subcontractor or subcontractor's surety shall file certified payroll statements with the public contracting agency in writing, pursuant to ORS 279C.845.
  - a. If a contractor is required to file certified statements under ORS 279C.845, the public contracting agency shall retain twenty-five percent (25%) of any amount earned by the contractor on the public works project until the contractor has filed with the public agency certified statement as required by ORS.279C.845. The public contracting agency shall pay the contractor the amount retained within fourteen (14) days after the contractor files the required certified statements, regardless of whether a subcontractor has failed to file certified statements required by statute. The public contracting agency is not required to verify the truth of the contents of certified statements filed by the contractor under this section and ORS 279C.845.
  - b. The contractor shall retain twenty-five percent (25%) of any amount earned by a first-tier subcontractor on this public works contract until the subcontractor has filed with the public agency certified statements as required by ORS 279C.845. The contractor shall verify that the first-tier subcontractor has filed the certified statements before the contractor may pay the subcontractor any amount retained. The contractor shall pay the first-tier subcontractor the amount retained within fourteen (14) days after the subcontractor files the certified statements as required by ORS 279C.845. Neither the public agency nor the contractor is required to verify the truth of the contents of certified statements filed by a first-tier subcontractor.
17. All employers, including Contractor, that employ subject workers who work under this contract shall comply with ORS 656.017 and provide the required Workers' Compensation

coverage, unless such employers are exempt under ORS 656.126. Contractor shall ensure that each of its subcontractors complies with these requirements.

18. All sums due the State Unemployment Compensation Fund from the Contractor or any Subcontractor in connection with the performance of the contract shall be promptly so paid.
19. The contract may be canceled at the election of public contracting agency for any willful failure on the part of Contractor to faithfully perform the contract according to its terms.
20. Contractor certifies that it has not discriminated against minorities, women or emerging small business enterprises in obtaining any required subcontractors.
21. Contractor certifies its compliance with the Oregon tax laws, in accordance with ORS 305.385.
22. In the performance of this contract, the Contractor shall use, to the maximum extent economically feasible, recycled paper, materials, and supplies.
23. Contractor certifies that all subcontractors performing construction work under this contract will be licensed with the Construction Contractors Board or licensed by the state Landscaper Contractors Board in accordance with 701.035 to 701.055 before the subcontractors commence work under this contract.
24. In compliance with the provisions of ORS 279C.525, the following is a list of federal, state and local agencies, of which the Owner has knowledge, that have enacted ordinances or regulations dealing with the prevention of environmental pollution and the preservation of natural resources that may affect the performance of the contract:
  - a. Federal Agencies:
    - 1) Agriculture, Department of
    - 2) Forest Service
    - 3) Soil Conservation Service
    - 4) Defense, Department of
    - 5) Army Corps of Engineers
    - 6) Environmental Protection Agency
    - 7) Interior, Department of
    - 8) Bureau of Sport Fisheries and Wildlife
    - 9) Bureau of Outdoor Recreation
    - 10) Bureau of Land Management
    - 11) Bureau of Indian Affairs
    - 12) Bureau of Reclamation
    - 13) Labor, Department of
    - 14) Occupational Safety and Health Administration
    - 15) Transportation, Department of
    - 16) Coast Guard
    - 17) Federal Highway Administration
  - b. State Agencies:
    - 1) Agriculture, Department of
    - 2) Environmental quality, Department of

- 3) Fish and Wildlife, Department of
- 4) Forestry, Department of
- 5) Geology and Mineral Industries, Department of
- 6) Human Resources, Department of
- 7) Land Conservation and Development Commission
- 8) Soil and Water Conservation Commission
- 9) State Engineer
- 10) State Land Board
- 11) Water Resources Board
- c. Local Agencies:
  - 1) City Council
  - 2) County Court
  - 3) County Commissioners, Board of
  - 4) Port Districts
  - 5) Metropolitan Service Districts
  - 6) County Service Districts
  - 7) Sanitary Districts
  - 8) Water Districts
  - 9) Fire Protection Districts
- M. ADD ARTICLE 17 U.S. DEPARTMENT OF COMMERCE - ECONOMIC DEVELOPMENT ADMINISTRATION (EDA) PUBLIC WORKS AND ECONOMIC ADJUSTMENT ASSISTANCE (PWEDA) PROGRAM GRANT REQUIREMENTS
  - 1. Contractor, Subcontractor(s), and all persons doing or contracting to do any work shall comply with all provisions of Federal Contracting Laws and Regulations as further specified in the documents listed below:
    - a. U.S. Department of Commerce Economic Development Administration - Summary of EDA Construction Standards
    - b. U.S. Department of Commerce Economic Development Administration - Standard Terms and Conditions for Construction Projects, February 12, 2016
    - c. Economic Development Administration (EDA) Contracting Provisions for Construction Projects, May 2016
    - d. Requirements for Affirmative Action (EEO)
    - e. Economic Development Administration (EDA) Site Sign Specifications

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 00 73 46 - DAVIS-BACON AND PREVAILING WAGE RATES

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 REQUIREMENTS:

- A. This contract is for public work and is subject to the Davis-Bacon Act (40 U.S.C. 276a) as well ORS 279C.800 to 279C.870 Prevailing Wage Rates, whichever is higher. Bidder's attention is directed to the requirements of employment and minimum wage rates to be paid. No bid will be considered or received unless the bid contains a statement by the bidder as part of its bid that Contractor agrees to be bound by, and will comply with the provisions of 40 U.S.C. 276a and ORS 279C.840 relating to Davis-Bacon Act or Prevailing Wages.
  - 1. Refer to the Wage Determination OnLine.gov to obtain the appropriate Davis-Bacon wage determinations (WDs) for this contract.
  - 2. The "Prevailing Wage Rates for Public Works Contracts in Oregon" dated January 1, 2018 including any issued corrections or amendments that follow are herein added to the Contract Documents by reference.
    - a. BOLI Prevailing Wage Rate information is available upon request, or electronically at [www.oregon.gov/boli](http://www.oregon.gov/boli).
    - b. Provisions described in this Section will apply regardless of the price of any individual Contract, so long as the combined price of all Contracts award on the project is \$50,000 or more.
    - c. If total Contract amount does not exceed \$50,000, Contractor is not required to pay prevailing wage rates.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

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# Wage Determinations OnLine.gov

Providing public access to federal wage determinations and related information.

WDOL.gov is part of the Integrated Acquisition Environment, one of the E-Government initiatives in the President's Management Agenda. It is a collaborative effort of the Office of Management and Budget, Department of Labor, Department of Defense, General Services Administration, Department of Energy, and Department of Commerce.

- [HOME](#)
- [FAQs](#) |
- [User Guide](#) |
- [Help](#) |

## Service Contract Act

- [Selecting SCA WDs](#)

- [e98](#)

- [Archived WDs](#)

- [WDs due to be revised](#)

- [PACT \(Price Adjustment Calculation Tool\)](#) **NEW!**

## Davis-Bacon Act

- [Selecting DBA WDs](#)

- [Archived WDs](#)

- [WDs due to be revised](#)

- [Rollover Crosswalk](#) **NEW!**

## Related Information

- [Agency Labor Advisors](#)

- [Library](#)

- [DOL Wage and Hour Website](#)

## Welcome to the Wage Determinations OnLine Program!

This website provides a single location for federal contracting officers to use in obtaining appropriate Service Contract Act (SCA) and Davis-Bacon Act (DBA) wage determinations (WDs) for each official contract action. The website is available to the general public as well. Guidance in selecting WDs from this website is provided in the WDOL.gov User's Guide.

Alternatively, the WDOL.gov Program also provides contracting officers direct access to the Department of Labor's (DOL's) "e98" website to submit a request for SCA WDs for use on official contract actions. In some instances, the WDOL.gov Program will not contain the appropriate SCA WD, and contracting officers will be directed to use DOL's e98 website in order to obtain the required SCA WD. DOL will provide the contracting officer with an SCA WD through the e98 system.

Questions pertaining to the application of contract labor standards or the selection of appropriate WDs for specific contract actions should be referred to the contracting officer or to the designated agency labor advisors. Questions pertaining to this website may be referred to the WDOL.gov Webmaster.

The WDOL.gov Program and the User's Guide does not relieve the contracting officer or other program user of the requirement to carefully review the contract or solicitation, federal acquisition regulations, and/or DOL regulations related to these actions.

**Where the contracting officer selects a SCA or DBA WD using the WDOL.gov Program and DOL later determines, whether before or after contract award, that the appropriate SCA or DBA WD was not incorporated in a covered contract, the contracting officer, within 30 days of notification by DOL, shall include in the contract the applicable WD issued by DOL.**

This site is best viewed with Microsoft Internet Explorer 6.0+ or Mozilla Firefox 1.0+ browsers

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# **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.

## **TABLE OF CONTENTS**

1. Definitions
2. Applicability
3. Federally Required Contract Provisions
4. Required Provisions Deemed Inserted
5. Inspection by EDA Representatives
6. Examination and Retention of Contractor's Records
7. Construction Schedule and Periodic Estimates
8. Contractor's Title to Material
9. Inspection and Testing of Materials
10. "OR EQUAL" Clause
11. Patent Fees and Royalties
12. Claims for Extra Costs
13. Contractor's and Subcontractor's Insurance
14. Contract Security Bonds
15. Labor Standards - Davis-Bacon and Related Acts
16. Labor Standards - Contract Work Hours and Safety Standards Act
17. Equal Employment Opportunity
18. Contracting with Small, Minority and Women's Businesses
19. Health, Safety and Accident Prevention
20. Conflict of Interest and Other Prohibited Interests
21. New Restrictions on Lobbying
22. Historical and Archaeological Data Preservation
23. Clean Air and Water
24. Use of Lead-Based Paints on Residential Structures
25. Energy Efficiency
26. Environmental Requirements
27. Debarment, Suspension, Ineligibility and Voluntary Exclusions
28. EDA Project Sign
29. Buy America

## 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:

Economic Development Administration  
Contracting Provisions for Construction Projects

(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
- Economic Development Administration  
Contracting Provisions for Construction Projects

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.

**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>
	10 %	6.9%

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	<u>Oregon</u>
County of	<u>Coos</u>
City of	<u>Coos Bay</u>

## 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

PRINTED NAME AND TITLE OF AUTHORIZED REPRESENTATIVE

SIGNATURE

DATE

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work performed by Owner.
4. Owner-furnished/Contractor-installed (OFCI) products.
5. Owner-furnished/Owner-installed (OFOI) products.
6. Contractor's use of site and premises.
7. Coordination with occupants.
8. Work restrictions.
9. Specification and Drawing conventions.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
2. Section 01 73 00 "Execution" for coordination of Owner-installed products.

1.3 PROJECT INFORMATION

- A. Project Identification: Project No. 4859-01, Southwestern, An Oregon Community College, Coaledo and Sumner Hall Renovations.
  1. Project Location: 1988 Newmark Avenue, Coos Bay, OR 97420.
- B. Owner: Owner: Southwestern Oregon Community College, 1988 Newmark Avenue Coos Bay, OR 97420.
- C. Architect: Opsis Architecture LLP, 920 NW Avenue, Portland, OR 97209. 503.525.9511. info@opsisarch.com. www.opsisarch.com.
- D. Contractor: To be determined.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
  1. Coaledo Hall: Complete renovation of 1970's building to include new exterior walls and windows under existing roof. All interior finishes and building systems to be replaced and upgraded and other Work indicated in the Contract Documents.
  2. Sumner Hall: Interior renovation of existing classroom and lab spaces. New interior finishes, HVAC and electrical work in altered spaces and other Work indicated in the Contract Documents.

- B. Type of Contract:
  - 1. Project will be constructed under a single prime contract.

1.5 WORK PERFORMED BY OWNER

- A. Cooperate fully with Owner, so work may be carried out smoothly, without interfering with or delaying Work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.
- B. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with Work under this Contract.
  - 1. Owner will provide dental chairs and equipment for contractor to install.

1.6 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

- A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:
  - 1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
  - 2. Provide for delivery of Owner-furnished products to Project site.
  - 3. Upon delivery, inspect, with Contractor present, delivered items.
    - a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.
  - 4. Obtain manufacturer's inspections, service, and warranties.
  - 5. Inform Contractor of earliest available delivery date for Owner-furnished products.
- B. Contractor's Responsibilities: The Work includes the following, as applicable:
  - 1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
  - 2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
  - 3. Receive, unload, handle, store, protect, and install Owner-furnished products.
  - 4. Make building services connections for Owner-furnished products.
  - 5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
  - 6. Repair or replace Owner-furnished products damaged following receipt.
- C. Owner-Furnished/Contractor-Installed (OFCI) Products:
  - 1. Owner will provide dental chairs and equipment, and audio-visual equipment for contractor to install.
    - a. General: AM3 Dental Chair / Infinity Delivery System, Infinity Assistant Package / Complete Junction Box, Diamond Dental Light.
      - 1) Basis-of-Design Product: AM3 Dental Chair / Infinity Delivery System, Infinity Assistant Package / Complete Junction Box, Diamond Dental Light by Dansereau Health Products; [www.dhpdental.com](http://www.dhpdental.com).
      - 2) Quantity: As indicated.

- b. General: Dansereau Dental Precision Wet Vacuum Pumps.
    - 1) Basis-of-Design Product: Dansereau Dental Precision Wet Vacuum Pumps Model no. DHP-PV1-Single by Dansereau Health Products; [www.dhpdental.com](http://www.dhpdental.com).
    - 2) Quantity: As indicated.
  - c. General: Dansereau Dental Quiet Flow Air Compressors.
    - 1) Basis-of-Design Product: Dansereau Dental Quiet Flow Air Compressors Model no. DHP-QF-101 by Dansereau Health Products; [www.dhpdental.com](http://www.dhpdental.com).
    - 2) Quantity: As indicated.
  - d. General: Dansereau Dental Roadrunner Hybrid Dry Vacuum Pumps.
    - 1) Basis-of-Design Product: Dansereau Dental Roadrunner Hybrid Dry Vacuum Pumps Model no. DHP-RRDV-2.5-Single by Dansereau Health Products; [www.dhpdental.com](http://www.dhpdental.com).
    - 2) Quantity: As indicated.
- 1.7 OWNER-FURNISHED/OWNER-INSTALLED (OFOI) PRODUCTS
- A. The Owner will furnish and install products indicated.
  - B. Owner-Furnished/Owner-Installed (OFOI) Products:
    - 1. Audio-Visual Equipment:
      - a. Basis-of-Design Product: As selected by Architect and Owner.
      - b. Product Purchase Status: Product reserved by Owner and installed by Contractor.
      - c. Quantity: As indicated.
- 1.8 CONTRACTOR'S USE OF SITE AND PREMISES
- A. Unrestricted Use of Site: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
  - B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
  - C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.
- 1.9 WORK RESTRICTIONS
- A. Comply with restrictions on construction operations.
    - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
  - B. On-Site Work Hours: Limit work to between 7:00 a.m. to 4:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
    - 1. Weekend Hours: None.
    - 2. Early Morning Hours: None.
    - 3. Work in Existing Building: None.

4. Hours for Utility Shutdowns: None.
5. Hours for Noisy Activity: None.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
  1. Notify Owner not less than two days in advance of proposed utility interruptions.
  2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Project site is not permitted.

#### 1.10 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- D. Drawing Coordination: Requirements for materials and products identified in Drawings are described in detail in the Specifications. One or more of the following are used in Drawings to identify materials and products:
  1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
  3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION



## SECTION 01 25 00 - SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
  - 1. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

#### 1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Owner.

#### 1.4 SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: For substitution tracking purposes, use applicable forms attached to this Section:
    - a. Substitution Request Form for Substitution Requests Prior to Bidding.
    - b. Substitution Request Form for Substitution Requests During Construction Administration.
  - 2. Documentation: In addition to Substitution Request Form, show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product, fabrication or installation method cannot be provided, if applicable.
    - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by others that will be necessary to accommodate proposed substitution.
    - c. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - d. Samples, where applicable or requested.
    - e. Certificates and qualification data, where applicable or requested.
    - f. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.

- g. Research reports evidencing compliance with building code in effect for Project, from ICC-ES, if applicable.
- h. Cost information, including a proposal of change, if any, in the Contract Sum.
- i. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
- j. Additionally, for Substitutions for Convenience:
  - 1) Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
  - 2) Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - 3) List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
  - 4) Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- 3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within five (5) working days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within ten(10) working days of receipt of request, or five (5) working days of receipt of additional information or documentation, whichever is later.
  - a. Forms of Acceptance: Change Order Request (COR), Construction Change Directive (CCD), or Architect's Supplemental Instructions (ASI) for minor changes in the Work.
  - b. Default to Specification: Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

#### 1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

#### 1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

## 1.7 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than ten (10) working days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - b. Requested substitution provides sustainable design characteristics that specified product provided for compliance with Project sustainability requirements.
    - c. Requested substitution provides specified warranty.
    - d. Substitution request is fully documented and properly submitted.
    - e. Requested substitution will not adversely affect Contractor's construction schedule.
    - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - g. Requested substitution is compatible with other portions of the Work.
    - h. Requested substitution has been coordinated with other portions of the Work.
    - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 calendar days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    - b. Requested substitution does not require extensive revisions to the Contract Documents.
    - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - d. Requested substitution provides sustainable design characteristics that specified product provided for compliance with Project sustainability requirements.
    - e. Requested substitution provides specified warranty.
    - f. Substitution request is fully documented and properly submitted.
    - g. Requested substitution will not adversely affect Contractor's construction schedule.
    - h. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - i. Requested substitution is compatible with other portions of the Work.

- j. Requested substitution has been coordinated with other portions of the Work.
- k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SUBSTITUTION REQUEST FORM  
For Substitution Requests During Bid Phase

Advancement of Construction Technology  
The Construction Specifications Institute

TO: \_\_\_\_\_

PROJECT: \_\_\_\_\_

SPECIFIED ITEM: \_\_\_\_\_

Section	Page	Paragraph	Description
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The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: \_\_\_\_\_

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes description of changes to Contract Documents which proposed substitution will require for its proper installation.

The undersigned states that the following paragraphs, unless modified on attachments, are ALL correct:

1. THE PROPOSED SUBSTITUTION DOES NOT AFFECT DIMENSIONS SHOWN ON DRAWINGS.
2. THE UNDERSIGNED WILL PAY FOR CHANGES TO THE BUILDING DESIGN, INCLUDING ENGINEERING DESIGN, DETAILING AND CONSTRUCTION COSTS CAUSED BY THE REQUESTED SUBSTITUTION.
3. THE PROPOSED SUBSTITUTION WILL HAVE NO ADVERSE EFFECT ON OTHER TRADES, THE CONSTRUCTION SCHEDULE, OR SPECIFIED WARRANTY REQUIREMENTS.
4. MAINTENANCE AND SERVICE PARTS WILL BE LOCALLY AVAILABLE FOR THE PROPOSED SUBSTITUTION.

The undersigned further states that the function, appearance and quality of the Proposed Substitution are equivalent or superior to the Specified Item.

Submitted by:

For use by Design Consultant:

Signature \_\_\_\_\_

Firm \_\_\_\_\_

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

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

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

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

<input type="checkbox"/>	<input type="checkbox"/>
Accepted	Accepted as noted
<input type="checkbox"/>	<input type="checkbox"/>
Not Accepted	Received too late

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

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

Remarks: \_\_\_\_\_

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SUBSTITUTION REQUEST FORM  
For Substitution Requests During  
Construction Administration Phase

Advancement of Construction Technology  
The Construction Specifications Institute

TO: \_\_\_\_\_

PROJECT: \_\_\_\_\_

SPECIFIED ITEM:

Section	Page	Paragraph	Description
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The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: \_\_\_\_\_

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes description of changes to Contract Documents which proposed substitution will require for its proper installation.

Substitutions for After Bidding: The undersigned states that the substitution is requested DUE TO AT LEAST ONE of the following conditions (indicate and substantiate condition in attachments; failure to identify one of these conditions will result in rejection of the substitution):

1. SPECIFIED PRODUCT IS NO LONGER AVAILABLE.
2. SPECIFIED PRODUCT IS NO LONGER COMPATIBLE, DUE TO CHANGES IN THE DESIGN DURING CONSTRUCTION.
3. A CHANGE IN GOVERNING REGULATORY REQUIREMENTS MAKES A REVISION IN DESIGN OR MATERIAL USAGE MANDATORY.
4. SUBSTITUTION OFFERS THE OWNER A SUBSTANTIAL ADVANTAGE IN COST, TIME, ENERGY CONSERVATION, OR OTHER CONSIDERATIONS (Provide substantiation for review).

The undersigned further states that the function, appearance and quality of the Proposed Substitution are equivalent or superior to the Specified Item.

Submitted by:

For use by Design Consultant:

Signature \_\_\_\_\_

Firm \_\_\_\_\_

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

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

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

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

<input type="checkbox"/>	<input type="checkbox"/>
Accepted	Accepted as noted
<input type="checkbox"/>	<input type="checkbox"/>
Revise and Resubmit	Not Accepted

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

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

Remarks: \_\_\_\_\_

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## SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
  - 1. Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
  - 2. Section 01 31 00 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

#### 1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710 "Architect's Supplemental Instructions (ASI)" or other form agreed to by Owner and Contractor.

#### 1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within time specified in Proposal Request or fourteen (14) working days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    - e. Quotation Form: Use AIA Document G709 "Proposal Request (PR)" or other form acceptable to Owner and Architect.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the

Contract, Contractor may initiate a claim by submitting a request for a change to Architect]

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701 "Change Order (CO)" or other form acceptable to Owner and Architect.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714 "Construction Change Directive (CCD)" or other form acceptable to Owner and Architect. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  - 1. Construction Change Directive contains a description of change in the Work. It may also designate method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 29 00 - PAYMENT PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
  - 1. Owner's Division 00 document "Proposed Schedule of Values Form" or other similar document for requirements for furnishing proposed schedule of values with bid.
  - 2. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 3. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

#### 1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
- B. Critical Path Method (CPM) Schedule: A scheduling method for a set of project activities, wherein a critical path is determined by identifying the longest stretch of dependent activities and measuring the time required to complete them from start to finish without making the project longer.

#### 1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. A Cost-loaded Critical Path Method (CPM) Schedule may serve to satisfy requirements for the schedule of values.
  - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
  - 2. Submit the schedule of values to Architect at earliest possible date, but no later than five (5) working days before the date scheduled for submittal of initial Applications for Payment.
  - 3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
  - 4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
  - 1. Identification: Include the following Project identification on the schedule of values:
    - a. Project name and location.

- b. Owner's name.
  - c. Owner's Project number.
  - d. Name of Architect.
  - e. Architect's Project number.
  - f. Contractor's name and address.
  - g. Date of submittal.
2. Arrange schedule of values consistent with format of AIA Document G703 "Continuation Sheet" or other form acceptable to Owner and Architect.
3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:
  - a. Related Specification Section or division.
  - b. Description of the Work.
  - c. Name of subcontractor.
  - d. Name of manufacturer or fabricator.
  - e. Name of supplier.
  - f. Change Orders (numbers) that affect value.
  - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
    - 1) Labor.
    - 2) Materials.
    - 3) Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five (5) percent of the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
  - a. Differentiate between items stored on-site and items stored off-site.
6. Purchase Contracts: Provide a separate line item in the schedule of values for each Purchase contract. Show line-item value of Purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
7. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
8. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
9. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five (5) percent of the Contract Sum and subcontract amount.
10. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Owner/ Contractor Agreement, or date as agreed to by Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Submit Application for Payment to Architect by the date agreed to by Owner and Contractor.
- D. Application for Payment Forms: Use AIA Document G702 "Application and Certificate for Payment" and AIA Document G703 "Continuation Sheet" as form for Applications for Payment.
  - 1. Other Application for Payment forms proposed by the Contractor may be acceptable to Architect and Owner. Submit forms for approval with initial submittal of schedule of values.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
  - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
  - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
  - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
  - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
  - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
  - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
  - 3. Provide summary documentation for stored materials indicating the following:
    - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- G. Transmittal: Submit three (3) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
  - 1. Alternatively, submit Application for Payment in Portable Document Format (PDF) with digital signatures.
  - 2. Transmit each copy with a transmittal form listing attachments and recording appropriate

information about application.

- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
  - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  - 2. When an application shows completion of an item, submit conditional final or full waivers.
  - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  - 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  - 5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
  - 1. List of subcontractors.
  - 2. Schedule of values.
  - 3. Contractor's construction schedule (preliminary if not final).
  - 4. Products list (preliminary if not final).
  - 5. Submittal schedule (preliminary if not final).
  - 6. List of Contractor's staff assignments.
  - 7. List of Contractor's principal consultants.
  - 8. Copies of building permits.
  - 9. Copies of authorizations and licenses from authorities having jurisdiction (AHJ) for performance of the Work.
  - 10. Initial progress report.
  - 11. Report of preconstruction conference.
  - 12. Submit the following, if not submitted before executing the Contract:
    - a. Certificates of insurance and insurance policies.
    - b. Performance and payment bonds.
    - c. Data needed to acquire Owner's insurance.
- J. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
  - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
    - a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 01 77 00 "Closeout Procedures."
  - 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted

and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Certification of completion of final punch list items.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Updated final statement, accounting for final changes to the Contract Sum.
5. AIA Document G706 "Contractor's Affidavit of Payment".
6. AIA Document G706A "Contractor's Affidavit of Release of Liens".
7. AIA Document G707 "Consent of Surety to Final Payment".
8. Evidence that claims have been settled.
9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
10. Final liquidated damages settlement statement.
11. Proof that taxes, fees, and similar obligations are paid.
12. Waivers and releases.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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## SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
  - 1. General coordination procedures.
  - 2. Coordination drawings.
  - 3. Requests for Information (RFIs).
  - 4. Project meetings.
- B. Related Requirements:
  - 1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
  - 2. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 3. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.

#### 1.3 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

#### 1.4 SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
  - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within ten (10) working days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
  - 1. Post copies of list in Project meeting room, in temporary field office. Keep list current at all times.

## 1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's construction schedule.
  - 2. Preparation of the schedule of values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.
  - 5. Progress meetings.
  - 6. Preinstallation conferences.
  - 7. Project closeout activities.
  - 8. Startup and adjustment of systems.

## 1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
  - 1. Exception: Coordination drawings are not required if installation is completely indicated and adequately coordinated on Shop Drawings prepared by a single fabricator. Ensure coordination with individual Sections.
    - a. Confirm coordination requirements with Project utilities.
  - 2. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    - b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.

- c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
  - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
  - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
  - f. Indicate required installation sequences.
  - g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
- 1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
  - 2. Plenum Space: Indicate subframing for support of ceiling, raised access floor where applicable, and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
  - 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
  - 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
  - 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
  - 6. Mechanical and Plumbing Work: Show the following:
    - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    - c. Fire-rated enclosures around ductwork.
  - 7. Electrical Work: Show the following:
    - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    - c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
    - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
  - 8. Fire-Protection System: Show the following:
    - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
  10. Coordination Drawing Deliverables: Prepare coordination drawing prints and/ or digital data files according to requirements in Section 01 33 00 "Submittal Procedures."
- C. Coordination Drawing Process: Prepare coordination drawings in the following manner:
1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
  2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping, using orange color. Forward drawings to Plumbing Installer.
  3. Plumbing Installer will locate plumbing and equipment, using blue color. Forward drawings to Fire Sprinkler Installer.
  4. Fire Sprinkler Installer will locate piping and equipment, using red color. Forward drawing files to Electrical Installer.
  5. Electrical Installer will indicate service and feeder conduit runs and equipment, using green color. Forward drawing files to Communications and Electronic Safety and Security Installer.
  6. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment, using purple color. Forward completed drawing files to Contractor.
  7. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.
- D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format:
    - a. Same digital data software program, version, and operating system as original Drawings.
    - b. DWG, DXF, or DGN, most current version, operating in Microsoft Windows operating system.
  2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format and PDF format.
  3. BIM File Incorporation: Develop and incorporate Contractor's coordination drawing files into BIM established for Project.
    - a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.
  4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
    - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
    - b. Digital Drawing Software Program: Drawings will be made available in version of digital drawing software program used by Architect.

- c. Contractor shall execute a data licensing agreement in the form of AIA Document C106 "Digital Data Licensing Agreement" or an agreement form acceptable to Owner and Architect.

1.7 REQUEST FOR INFORMATION (RFI)

- A. General: On discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
  1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
  2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
  1. Project name.
  2. Owner name.
  3. Owner's Project number.
  4. Name of Architect.
  5. Architect's Project number.
  6. Date.
  7. Name of Contractor.
  8. RFI number, numbered sequentially.
  9. RFI subject.
  10. Specification Section number and title and related paragraphs, as appropriate.
  11. Drawing number and detail references, as appropriate.
  12. Field dimensions and conditions, as appropriate.
  13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  14. Contractor's signature.
  15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: AIA Document G716 "Request for Information (RFI)" or form with substantially the same content as indicated above, acceptable to Architect.
  1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow five (5) working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day. For RFIs requiring Architect's subconsultant review, allow ten (10) working days for Architect's response for each RFI.
  1. The following Contractor-generated RFIs will be returned without action:
    - a. Requests for approval of submittals.

- b. Requests for approval of substitutions.
    - c. Requests for approval of Contractor's means and methods.
    - d. Requests for coordination information already indicated in the Contract Documents.
    - e. Requests for adjustments in the Contract Time or the Contract Sum.
    - f. Requests for interpretation of Architect's actions on submittals.
    - g. Incomplete RFIs or inaccurately prepared RFIs.
  - 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
  - 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within three (3) working days of receipt of the RFI response.
  - E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log prior to each progress meeting. Include the following:
    - 1. Project name.
    - 2. Name and address of Contractor.
    - 3. Name and address of Architect.
    - 4. RFI numbers, including RFIs that were returned without action or withdrawn.
    - 5. RFI descriptions.
    - 6. Date the RFIs were submitted.
    - 7. Date Architect's responses were received.
    - 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
  - F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within three (3) working days if Contractor disagrees with response.
- 1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES
- A. Use of Architect's Digital Data Files: Digital data files of Architect's BIM or CAD drawings will be provided by Architect for Contractor's use during construction.
    - 1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
    - 2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
    - 3. Digital Drawing Software Program: Contract Drawings will be made available in version of digital drawing software program used by Architect.
    - 4. Contractor and their subcontractors shall execute a data licensing agreement in the form of AIA Document C106 "Digital Data Licensing Agreement" or other agreement form acceptable to Owner and Architect.

5. For projects without BIM model, the following CAD files will be furnished for each appropriate discipline:
  - a. Floor plans.
  - b. Reflected ceiling plans.
- B. Portable Document Format (PDF) File Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
  1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  2. Name file with submittal number or other unique identifier, including revision identifier.
  3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

#### 1.9 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
  1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of five (5) working days prior to meeting.
  2. Agenda: Prepare the meeting agenda for distribution at the meeting. Distribute a draft agenda in digital format to all invited attendees prior to the meeting.
  3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three (3) working days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than ten (10) working days after execution of the Agreement.
  1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Responsibilities and personnel assignments.
    - b. Tentative construction schedule.
    - c. Critical work sequencing and long lead items.
    - d. Designation of key personnel and their duties.
    - e. Lines of communications.
    - f. Procedures for RFIs.
    - g. Procedures for processing field decisions and Change Orders.
    - h. Procedures for testing and inspecting.
    - i. Procedures for processing Applications for Payment.
    - j. Distribution of the Contract Documents.
    - k. Submittal procedures.

- l. Preparation of Record Documents.
    - m. Use of the premises and existing building(s), if any.
    - n. Work restrictions.
    - o. Working hours.
    - p. Owner's occupancy requirements, if applicable.
    - q. Responsibility for temporary facilities and controls.
    - r. Procedures for moisture and mold control.
    - s. Procedures for disruptions and shutdowns.
    - t. Construction waste management and recycling.
    - u. Parking availability.
    - v. Office, work, and storage areas.
    - w. Equipment deliveries and priorities.
    - x. Health, safety and site security.
    - y. Progress cleaning.
  - 3. Minutes: Record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.
  - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the activity under consideration, including requirements for the following:
    - a. Contract Documents.
    - b. Related RFIs.
    - c. Related Change Orders.
    - d. Submittals.
    - e. Purchases.
    - f. Deliveries.
    - g. Review of mockups, where applicable.
    - h. Coordination with other work.
    - i. Possible conflicts.
    - j. Compatibility requirements.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written instructions.
    - n. Warranty requirements.
    - o. Compatibility of materials.



- p. Acceptability of substrates.
  - q. Temporary facilities and controls.
  - r. Space and access limitations.
  - s. Regulations of authorities having jurisdiction (AHJ).
  - t. Protection of adjacent work.
  - u. Installation procedures.
  - v. Required performance results.
  - w. Testing and inspecting requirements.
  - x. Protection of construction and personnel.
- 3. Record significant conference discussions and major decisions, including required corrective measures and actions.
  - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than thirty (30) calendar days prior to the scheduled date of Substantial Completion.
- 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
  - 2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    - a. Preparation of Record Documents.
    - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    - c. Procedures for completing and archiving web-based Project software site data files.
    - d. Requirements for preparing operations and maintenance data.
    - e. Requirements for delivery of material samples, attic stock, and spare parts.
    - f. Requirements for demonstration and training.
    - g. Preparation of Contractor's punch list.
    - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    - i. Closeout submittal procedures, including written warranties.
    - j. Installation of Owner's furniture, fixtures, and equipment.
    - k. Responsibility for removing temporary facilities and controls.
  - 4. Minutes: Record and distribute meeting minutes.

- E. Progress Meetings: Conduct progress meetings at weekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
  2. Attendees: In addition to representatives of Owner and Architect, each subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site use.
      - 8) Temporary facilities and controls.
      - 9) Progress cleaning.
      - 10) Quality and work standards.
      - 11) Status of correction of deficient items.
      - 12) Field observations.
      - 13) Status of RFIs.
      - 14) Status of Proposal Requests.
      - 15) Pending changes.
      - 16) Status of Change Orders.
      - 17) Pending claims and disputes.
      - 18) Documentation of information for payment requests.
  4. Minutes: Record and distribute the meeting minutes to each party present and to parties requiring information.
    - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

- F. Coordination Meetings: Conduct Project coordination meetings at intervals as necessary to coordinate specific portions of Project work. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - b. Schedule Updating: Revise Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    - c. Review present and future needs of each contractor present, including the following, where applicable to coordination meeting:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site use.
      - 8) Temporary facilities and controls.
      - 9) Work hours.
      - 10) Hazards and risks.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Status of RFIs.
      - 14) Proposal Requests.
      - 15) Change Orders.
      - 16) Pending changes.
  3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Startup construction schedule.
  - 2. Contractor's Construction Schedule.
  - 3. Construction schedule updating reports.
  - 4. Daily construction reports.
  - 5. Material location reports.
  - 6. Site condition reports.
  - 7. Unusual event reports.
- B. Related Requirements:
  - 1. Section 01 29 00 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.
  - 2. Section 01 40 00 "Quality Requirements" for schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
  - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
  - 2. Predecessor Activity: An activity that precedes another activity in the network.
  - 3. Successor Activity: An activity that follows another activity in the network.
- B. Bar Chart-Type Schedule: For Project construction value greater than \$2,000,000.00, or as required by Owner, provide CPM-Type schedule defined below. Bar Chart-Type schedules e.g., Gantt, are otherwise acceptable.
- C. CPM-Type Schedule Definitions:
  - 1. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.
  - 2. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine the critical path of Project and when activities can be performed.
  - 3. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
  - 4. Event: The starting or ending point of an activity.

5. Float: The measure of leeway in starting and completing an activity.
  - a. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
  - b. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
  - c. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
6. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

#### 1.4 SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
  1. Working electronic copy of schedule file.
  2. Portable Document Format (PDF) file.
  3. where required by Owner, provide three (3) paper copies, of sufficient size to display entire period or schedule, as required.
- B. Startup construction schedule.
  1. If Application for Payment submittals are required to use network cost- and resource-loaded reporting per Section 01 29 00 "Payment Procedures", submittal of cost-loaded startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
  1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
  1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
  2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
  3. Total Float Report: List of activities sorted in ascending order of total float.
  4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
- F. Construction Schedule Updating Reports: Submit with Applications for Payment.
- G. Daily Construction Reports: Submit at weekly intervals.
- H. Material Location Reports: Submit at weekly intervals.
- I. Site Condition Reports: Submit at time of discovery of differing conditions.

- J. Unusual Event Reports: Submit at time of unusual event.
- K. Qualification Data: For projects requiring CPM-type schedule, provide qualification data for scheduling consultant.

#### 1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: For projects requiring CPM-type schedule, an experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B. Prescheduling Conference: Conduct conference at Project site or other location as agreed to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:
  - 1. Review software capabilities and content and format for reports.
  - 2. Identify qualified personnel responsible to develop and update schedule.
  - 3. Discuss constraints, including partial Owner occupancy.
  - 4. Review delivery dates for Owner-furnished products.
  - 5. Review schedule for work of Owner's separate contracts.
  - 6. Review submittal requirements and procedures.
  - 7. Review time required for review of submittals and resubmittals.
  - 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
  - 9. Review time required for Project closeout and Owner startup procedures.
  - 10. Review and finalize list of construction activities to be included in schedule.
  - 11. Review procedures for updating schedule.

#### 1.6 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
  - 1. Secure time commitments for performing critical elements of the Work from entities involved.
  - 2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

#### 1.7 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Computer Scheduling Software: For projects requiring CPM-type schedule, prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
  - 1. Use Microsoft Project, Oracle Primavera, Meridian Prolog, or scheduling component of Project management software package specified in Section 01 31 00 "Project Management and Coordination," for current Windows operating system.

- B. Scheduling Consultant: For projects requiring CPM-type schedule, engage a consultant to provide planning, evaluation, and reporting, using CPM scheduling.
  - 1. In-House Option: Owner may waive requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
  - 2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.
- C. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
  - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- D. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
  - 1. Activity Duration: Define activities so no activity is longer than 20 calendar days, unless specifically allowed by Architect.
  - 2. Temporary Facilities: Indicate start and completion dates for the following as applicable:
    - a. Securing of approvals and permits required for performance of the Work.
    - b. Temporary facilities.
    - c. Construction of mockups, prototypes and samples.
    - d. Owner interfaces and furnishing of items.
    - e. Regulatory agency approvals.
    - f. Punch list.
  - 3. Procurement Activities: Include procurement process activities for the following long lead-time items and major items, requiring a cycle of more than 60 calendar days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
  - 4. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
  - 5. Startup and Testing Time: Include no fewer than 10 working days for startup and testing.
  - 6. Commissioning Time: Include no fewer than 10 working days for commissioning.
  - 7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
  - 8. Punch List and Final Completion: Include not more than 30 calendar days for completion of punch list items and Final Completion.
- E. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
  - 1. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
  - 2. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.



3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
4. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
  - a. Subcontract awards.
  - b. Submittals.
  - c. Purchases.
  - d. Mockups.
  - e. Fabrication.
  - f. Sample testing.
  - g. Deliveries.
  - h. Installation.
  - i. Tests and inspections.
  - j. Adjusting.
  - k. Curing.
  - l. Building flush-out, where required in other Sections.
  - m. Startup and placement into final use and operation.
- F. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- G. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
  1. Refer to Section 01 29 00 "Payment Procedures" for cost reporting and payment procedures.
- H. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
  1. Unresolved issues.
  2. Unanswered Requests for Information.
  3. Rejected or unreturned submittals.
  4. Notations on returned submittals.
  5. Pending modifications affecting the Work and the Contract Time.
- I. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule three (3) working days before the next occurring scheduled progress meeting.
  1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  3. As the Work progresses, indicate Final Completion percentage for each activity.

- J. Recovery Schedule: When periodic update indicates the Work is ten (10 or more working days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
- K. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
  - 1. Post copies in Project meeting rooms and temporary field offices.
  - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

#### 1.8 STARTUP CONSTRUCTION SCHEDULE

- A. Bar Chart-Type Schedule: Submit startup, horizontal, bar chart-type construction schedule within ten (10) working days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 calendar days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

#### 1.9 BAR CHART-TYPE SCHEDULE REQUIREMENTS

- A. Bar Chart-Type Schedule: Submit a comprehensive, fully developed, horizontal, bar chart-type (e.g., Gantt), Contractor's Construction Schedule within 30 calendar days after date established for the Notice to Proceed.
  - 1. Base schedule on the startup construction schedule and additional information received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
  - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in ten (10) percent increments within time bar.

#### 1.10 CPM-TYPE SCHEDULE REQUIREMENTS

- A. Prepare network diagrams using activity-on-node (AON) format.
- B. Startup Network Diagram: Submit diagram within 14 calendar days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 calendar days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM-Type Schedule: Prepare Contractor's Construction Schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.
  - 1. Develop network diagram in sufficient time to submit CPM-type schedule, so it can be accepted for use no later than 60 calendar days after date established for the Notice to Proceed.
    - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM-type schedule information.
  3. Establish procedures for monitoring and updating CPM-type schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
  4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.
- D. CPM-Type Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
    - a. Preparation and processing of submittals.
    - b. Mobilization and demobilization.
    - c. Purchase of materials.
    - d. Delivery.
    - e. Fabrication.
    - f. Utility interruptions.
    - g. Installation.
    - h. Work by Owner that may affect or be affected by Contractor's activities.
    - i. Testing and inspection.
    - j. Punch list and Final Completion.
    - k. Activities occurring following Final Completion.
  2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
  3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM-type schedule within the limitations of the Contract Time.
  4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
    - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
  5. Cost- and Resource-Loading of CPM-Type Schedule: Assign cost to construction activities on the CPM-type schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of five (5) percent of the Contract Sum.
    - a. Total cost assigned to activities shall equal the total Contract Sum.
- E. Contract Modifications: For each proposed Contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.

- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
  2. Description of activity.
  3. Main events of activity.
  4. Immediate preceding and succeeding activities.
  5. Early and late start dates.
  6. Early and late finish dates.
  7. Activity duration in workdays.
  8. Total float or slack time.
  9. Average size of workforce.
  10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
  2. Changes in early and late start dates.
  3. Changes in early and late finish dates.
  4. Changes in activity durations in workdays.
  5. Changes in the critical path.
  6. Changes in total float or slack time.
  7. Changes in the Contract Time.
- H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
  2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
  3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
  4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
    - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    - b. Submit value summary printouts three (3) working days before each regularly scheduled progress meeting.

#### 1.11 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
  2. List of separate contractors at Project site.

3. Approximate count of personnel at Project site.
  4. Equipment at Project site.
  5. Material deliveries.
  6. High and low temperatures and general weather conditions, including presence of rain or snow.
  7. Testing and inspection.
  8. Accidents.
  9. Meetings and significant decisions.
  10. Unusual events.
  11. Stoppages, delays, shortages, and losses.
  12. Meter readings and similar recordings.
  13. Emergency procedures.
  14. Orders and requests of authorities having jurisdiction.
  15. Change Orders received and implemented.
  16. Construction Change Directives received and implemented.
  17. Services connected and disconnected.
  18. Equipment or system tests and startups.
  19. Partial completions and occupancies.
  20. Substantial Completions authorized.
- B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
  2. Material stored prior to previous report and since removed from storage and installed.
  3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information.
1. Advise Owner in advance when these events are known or predictable.
  2. Submit unusual event reports directly to Owner within one (1) working day of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 33 00 - SUBMITTAL PROCEDURES

### 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. Submittal schedule requirements.
  - 2. Administrative and procedural requirements for submittals.
- B. Related Requirements:
  - 1. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
  - 2. Section 01 31 00 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
  - 3. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
  - 4. Section 01 40 00 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
  - 5. Section 01 77 00 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
  - 6. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  - 7. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

#### 1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

#### 1.4 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
  - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
  - 2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include

submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
  - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
  - a. Scheduled date for first submittal.
  - b. Specification Section number and title.
  - c. Submittal Category: Action; informational.
  - d. Name of subcontractor.
  - e. Description of the Work covered.
  - f. Scheduled date for Architect's final release or approval.
  - g. Scheduled dates for purchasing.
  - h. Scheduled date of fabrication.
  - i. Scheduled dates for installation.
  - j. Activity or event number.

#### 1.5 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.
7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
8. Category and type of submittal.
9. Submittal purpose and description.
10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
11. Drawing number and detail references, as appropriate.
12. Indication of full or partial submittal.
13. Location(s) where product is to be installed, as appropriate.
14. Other necessary identification.
15. Remarks.
16. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.



- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Paper Submittals:
  - 1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
  - 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
  - 3. Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
  - 4. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
  - 5. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using AIA Document G810 transmittal form.
- E. Electronic Mail (Email) Submittals: Prepare submittals as Portable Document Format (PDF) package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- F. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

#### 1.6 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
  - 1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
    - a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
  - 2. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
  - 3. Paper: Prepare submittals in paper form and deliver to Architect.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  - 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals

concurrently for coordination.

- a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 10 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 10 working days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 15 working days for initial review of each submittal.
  5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 10 working days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
- a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
  3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

#### 1.7 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.

- d. Statement of compliance with specified referenced standards.
  - e. Testing by recognized testing agency.
  - f. Application of testing agency labels and seals.
  - g. Notation of coordination requirements.
  - h. Availability and delivery time information.
- 4. For equipment, include the following in addition to the above, as applicable:
  - a. Wiring diagrams that show factory-installed wiring.
  - b. Printed performance curves.
  - c. Operational range diagrams.
  - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
- 5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
  - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  - 2. PDF and Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
    - a. Paper Shop Drawings: Three opaque copies of each submittal. Architect will retain two copies; remainder will be returned.
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
  - 1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
  - 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
    - a. Project name and submittal number.
    - b. Generic description of Sample.
    - c. Product name and name of manufacturer.
    - d. Sample source.
    - e. Number and title of applicable Specification Section.
    - f. Specification paragraph number and generic name of each item.

3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
  4. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
  5. Paper Transmittal: Include paper transmittal, including complete submittal information indicated.
  6. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  7. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect shall return submittal with options selected.
  8. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    - a. Number of Samples: Submit three sets of Samples. Architect shall retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
      - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact

information of architects and owners, and other information specified.

- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
  2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
  3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
  4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
  5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
  6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.
- H. Test and Research Reports:
1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
  2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
  3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
  4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
  5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
  6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
    - a. Name of evaluation organization.
    - b. Date of evaluation.

- c. Time period when report is in effect.
- d. Product and manufacturers' names.
- e. Description of product.
- f. Test procedures and results.
- g. Limitations of use.

#### 1.8 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
- C. BIM Incorporation: Incorporate delegated design drawing and data files into BIM established for Project.
  - 1. Prepare delegated design drawings in the same digital data software program, version, and operating system as original Drawings.

#### 1.9 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
  - 1. Architect shall not review submittals received from Contractor that do not have Contractor's review and approval.

#### 1.10 ARCHITECT'S REVIEW

- A. Submittals: Architect shall review each submittal, indicate corrections or revisions required.
  - 1. Paper Submittals: Architect shall stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
  - 2. PDF Submittals: Architect shall indicate, via markup on each submittal, the appropriate action.
  - 3. Submittals by Web-Based Project Management Software: Architect shall indicate, on Project management software website, the appropriate action.
- B. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- C. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned

for resubmittal without review.

- D. Submittals received from sources other than Contractor will be returned without review.
- E. Submittals not required by the Contract Documents will be returned without action.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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## SECTION 01 40 00 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner or authorities having jurisdiction are not limited by provisions of this Section.

#### 1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
  - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.
  - 1. Mockups are used for one or more of the following:
    - a. Verify selections made under Sample submittals.
    - b. Demonstrate aesthetic effects.
    - c. Demonstrate the qualities of products and workmanship.
    - d. Demonstrate successful installation of interfaces between components and systems.

- e. Perform preconstruction testing to determine system performance.
  - 2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
  - 3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
  - E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
  - F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
  - G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
  - H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."
  - I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
  - J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.
- 1.4 DELEGATED DESIGN SERVICES
- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
    - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
  - B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.
- 1.5 CONFLICTING REQUIREMENTS
- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.
  - B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply

with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

#### 1.6 SUBMITTALS

##### A. Mockup Shop Drawings:

1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.
2. Indicate manufacturer and model number of individual components.
3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

##### B. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

##### C. Qualification Data: For Contractor's quality-control personnel.

##### D. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

##### E. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

##### F. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

##### G. Reports: Prepare and submit certified written reports and documents as specified.

##### H. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

#### 1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

##### A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be

used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.

- B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
  - 1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
  - 1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
  - 2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
  - 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

#### 1.8 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, telephone number, and email address of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.
  - 7. Identification of product and Specification Section.
  - 8. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.
  - 10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.

11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  12. Name and signature of laboratory inspector.
  13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of technical representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Statement that products at Project site comply with requirements.
  4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement of whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of factory-authorized service representative making report.
  2. Statement that equipment complies with requirements.
  3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  4. Statement of whether conditions, products, and installation will affect warranty.
  5. Other required items indicated in individual Specification Sections.

#### 1.9 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services

of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

- F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
  - 1. Requirements of authorities having jurisdiction supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following Contractor's responsibilities, including the following:
  - 1. Provide test specimens representative of proposed products and construction.
  - 2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
  - 3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
  - 4. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
  - 5. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
  - 6. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
  - 1. General:
    - a. Build mockups of size indicated.
    - b. Build mockups in location indicated or, if not indicated, as directed by Architect.
    - c. Notify Architect five working days in advance of dates and times when mockups will be constructed.

- d. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
- e. Demonstrate the proposed range of aesthetic effects and workmanship.
- f. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.
  - 1) Allow five working days for initial review and each re-review of each mockup.
- g. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
- h. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- i. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
- j. Demolish and remove mockups when directed unless otherwise indicated.

#### 1.10 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
  - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
  - 2. Payment for these services will be made from testing and inspection allowances specified in Section 012100 "Allowances," as authorized by Change Orders.
  - 3. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
  - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  - 2. Engage a qualified testing agency to perform quality-control services.
    - a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  - 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
  - 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  - 5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  - 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
  - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  - 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
  - 3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
  - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  - 6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
  - 1. Access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
  - 4. Facilities for storage and field curing of test samples.
  - 5. Delivery of samples to testing agencies.
  - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  - 7. Security and protection for samples and for testing and inspection equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.



- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
  1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
  2. Distribution: Distribute schedule to Owner, Architect testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

#### 1.11 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in the Statement of Special Inspections attached to this Section, and as follows:
  1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.
  2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
  3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
  4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
  5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
  6. Retesting and reinspecting corrected Work.

#### PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION

##### 3.1 MOCKUPS

- A. Mockups: Before installing final portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements as indicated, using materials indicated for the completed Work:
  1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
  2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
  3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at the Project.
  4. Demonstrate the proposed range of aesthetic effects and workmanship.
  5. Obtain Architect's acceptance of mockups before starting work, fabrication, or construction.
    - a. Allow seven days for initial review and each re-review of each mockup.
  6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

7. Demolish and remove mockups when directed, unless otherwise indicated.

### 3.2 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
  1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. Date test or inspection results were transmitted to Architect.
  4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's authorities' having jurisdiction (AHJ) reference during normal working hours.
  1. Submit log at Project closeout as part of Project Record Documents.

### 3.3 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
  1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
  - 1. Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

- A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction (AHJ).
- B. Sewer Service: Owner will pay sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Owner will pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Owner will pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within 10 working days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- D. Provide erosion and sedimentation control plan. Show compliance with Authority Having Jurisdiction (AHJ) and state regulations.
- E. Fire-Safety Program: Show compliance with requirements of NFPA 241 and AHJ. Indicate Contractor personnel responsible for management of fire-prevention program.
- F. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
  - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
  - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials

concrete grinding and polishing, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

3. Indicate methods to be used to avoid trapping water in finished work.
  - G. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
    1. Locations of dust-control partitions at each phase of work.
    2. HVAC system isolation schematic drawing.
    3. Location of proposed air-filtration system discharge.
    4. Waste-handling procedures.
    5. Other dust-control measures.
  - H. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by the Owner or others. Include the following:
    1. Methods used to meet the goals and requirements of the Owner.
    2. Concrete cutting method(s) to be used.
    3. Location of construction devices on the site.
    4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
- 1.5 QUALITY ASSURANCE
- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
  - B. Tests and Inspections: Arrange for AHJ to test and inspect each temporary utility before use. Obtain required certifications and permits.
  - C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- 1.6 PROJECT CONDITIONS
- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.
- B. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.
- C. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

## 2.2 TEMPORARY FACILITIES

- A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
  - 1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
  - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-VAC duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
  - 3. Drinking water dispenser.
  - 4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
  - 5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
  - 1. Do not store combustible materials in Project building.

## 2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL-rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline- or kerosene-burning space heaters, open-flame heaters, salamander-type heaters, or other portable forced-air or convection heater units that produce heat by using a fan or other means to push cold air though a flame is prohibited.
  - 2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to AHJ, and marked for intended location and application.
  - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 77 00 "Closeout Procedures."
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

## PART 3 - EXECUTION

### 3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
  - 1. Coordinate with Section 01 74 19 "Construction Waste Management and Disposal."
  - 2. Salvage materials and equipment involved in performance of, but not actually incorporated

into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

### 3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
  - 1. Locate facilities to limit site disturbance as specified in Section 01 10 00 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

### 3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
  - 1. Connect temporary sewers to municipal system as directed by AHJ.
- C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
  - 1. If facilities are unavailable or if their use is not permitted even if available, install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities where required for construction activities, and drinking water for use of construction personnel. Comply with requirements of AHJ for type, number, location, operation, and maintenance of fixtures and facilities.
  - 1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.
- E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
  - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- F. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner. At Substantial Completion, restore these service to condition existing before initial use.
  - 1. Connect temporary service to Owner's existing power source, as directed by Owner.
  - 2. If service is unavailable or if use is not permitted even if available, install electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations. Install electric power service underground unless otherwise indicated.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
  - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all

construction personnel. Install one land-based telephone line for each field office.

1. At each telephone, post a list of important telephone numbers.
  - a. Police and fire departments.
  - b. Ambulance service.
  - c. Contractor's main office.
  - d. Contractor's emergency after-hours telephone number.
  - e. Architect's office.
  - f. Engineers' offices.
  - g. Owner's office.
  - h. Principal subcontractors' field and main offices.
- I. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.
  1. Internet Service: Broadband modem, router, and ISP, equipped with hardware firewall, providing minimum 10-Mbps upload and 15-Mbps download speeds at each computer.

### 3.4 VIRTUAL/ REMOTE MEETING EQUIPMENT

- A. Virtual/ Remote Meeting Computer: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications. Equip computer with not less than the following:
  1. Processor: Intel Core i5 or i7.
  2. Memory: 16 gigabyte.
  3. Disk Storage: 1-terabyte hard-disk drive and combination DVD-RW/CD-RW drive.
  4. Storage Backup: External hard drive, minimum 2 terrabytes, with automated backup software providing daily backups.
  5. Display: 42-inch minimum LCD monitor and wall-mounting hardware; display driver 256-Mb dedicated video RAM.
  6. Full-size, wireless keyboard and mouse.
  7. Network Connectivity: 10/100BaseT ethernet.
  8. Operating System: Microsoft Windows 10 Professional, or other latest version.
  9. Productivity Software:
    - a. Adobe Reader DC, latest version.
    - b. Bluebeam Revu, latest version.
    - c. Google Chrome internet browser, latest version.
    - d. Microsoft Office Professional 2021, or other latest version, including Word, Excel, and Outlook.
    - e. WinZip 10.0, or other latest version.
  10. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.
- B. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions.

3.5 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:
  - 1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
  - 2. Utilize designated area within existing building for temporary field offices.
  - 3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated in Drawings.
  - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
  - 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
  - 2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with Section 31 20 00 "Earth Moving."
  - 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
  - 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course in accordance with Section 32 12 16 "Asphalt Paving."
- D. Traffic Controls: Comply with requirements of AHJ.
  - 1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
  - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- F. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- G. Dewatering Facilities and Drains: Comply with requirements of AHJ and soil-conservation district requirements, where applicable. Maintain Project site, excavations, and construction free of water.
  - 1. Refer to Geotechnical Report for expected ground water.
  - 2. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
  - 3. Remove snow and ice as required to minimize accumulations.
- H. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
  - 1. Identification Signs: Provide Project identification signs as indicated in Drawings.
  - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.



- a. Provide temporary, directional signs for construction personnel and visitors.
  - 3. Maintain and touch up signs, so they are legible at all times.
  - I. Waste Disposal Facilities: Comply with requirements of AHJ.
    - 1. Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."
    - 2. Provide waste-collection containers in sizes adequate to handle waste from construction operations.
    - 3. Comply with progress cleaning requirements in Section 01 73 00 "Execution."
  - J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
    - 1. For Cost-Plus Contracts: Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- 3.6 SECURITY AND PROTECTION FACILITIES INSTALLATION
- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
    - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
  - B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
    - 1. Comply with work restrictions specified in Section 01 10 00 "Summary."
  - C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings, requirements of EPA Construction General Permit, or AHJ, whichever is more stringent.
    - 1. Requirements specified in Section 31 10 00 "Site Clearing" shall govern where more stringent.
    - 2. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
    - 3. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
    - 4. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
    - 5. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.
  - D. Stormwater Control: Comply with requirements of AHJ. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
  - E. Tree and Plant Protection: Comply with requirements specified in Section 01 56 39 "Temporary Tree and Plant Protection."
    - 1. Lacking this Division 01 Section, install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

- F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by AHJ.
- G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
  - 1. Extent of Fence: As indicated on Drawings, as required to enclose entire Project site, or portion determined sufficient to accommodate construction operations.
- H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- I. Barricades, Warning Signs, and Lights: Comply with requirements of AHJ for erecting structurally adequate barricades, including warning signs and lighting.
- J. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by AHJ. Provide signage directing occupants to temporary egress.
- K. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of AHJ and requirements indicated in Drawings.
  - 1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
  - 2. Paint and maintain appearance of walkway for duration of the Work.
- L. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
  - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- M. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
  - 1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
  - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of AHJ.
  - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
  - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

### 3.7 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject

to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
  - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
  - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
  - c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

### 3.8 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
  1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection

facilities to permanent facilities until Substantial Completion.

- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
  2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by AHJ.
  3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION

## SECTION 01 57 22 - CONSTRUCTION INDOOR AIR QUALITY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section describes Construction Indoor Air Quality (IAQ) goals and includes administrative and procedural requirements for the development and execution of a construction air quality management plan.
- B. Related Requirements:
  - 1. Section 01 25 00 "Submittal Procedures" for required submittal procedures.
  - 2. Section 01 50 00 "Temporary Facilities and Controls" requirements for installation, maintenance and removal of temporary utilities, controls, and facilities during construction.
  - 3. Section 01 60 00 "Product Requirements" procedures for storage of interior materials to prevent exposure to moisture and pollutants.
  - 4. Division 23 "Heating Ventilating and Cooling" sections for duct cleaning procedures.

#### 1.3 INDOOR AIR QUALITY MANAGEMENT

- A. The Owner has established that the contractor shall prevent indoor air quality problems resulting from the construction process, to sustain long term installer and occupant health and comfort.
- B. Protect the ventilation system components during construction and clean contaminated components after construction is complete.
- C. Control sources of potential IAQ pollutants by controlling selection of materials and processes used in project construction.

#### 1.4 SUBMITTALS

- A. IAQ Management Plan for the construction and pre-occupancy phases of the project.
- B. Photographs documenting construction IAQ management measures implemented during construction such as duct protection measures and measures to protect on-site stored or installed absorptive materials from moisture.
- C. Cut sheets of filtration media used during construction with MERV values highlighted.

#### 1.5 CONSTRUCTION AIR QUALITY MANAGEMENT PLAN

- A. Develop a Draft Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:
  - 1. During construction meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition 2007, ANSI/ SMACNA 008-2008 (Chapter 3).
  - 2. Protect stored on-site or installed absorptive materials from moisture damage.
- B. The SMACNA IAQ Guidelines for Occupied Buildings under Construction provides an overview of air pollution associated with construction, control measures, construction process management, quality control, communicating with occupants, and case studies. These guidelines can be accessed at [www.smacna.org](http://www.smacna.org). Chapter 3 of the SMACNA Guidelines

recommends Control Measures in five areas: HVAC protection, source control, pathway interruption, housekeeping, and scheduling. Review the applicability of each Control Measure and include those that apply in the Draft IAQ Management Plan.

1. HVAC Protection: Shut down the return side of the HVAC system whenever possible during heavy construction. If the system must remain operational during construction include the following strategies that apply:
  - a. Fit the return side of the HVAC system with temporary filters with a Minimum Efficiency Reporting Value (MERV) of 8.
  - b. Isolate the return side of the HVAC system from the surrounding environment as much as possible (e.g., place all tiles for the ceiling plenum, repair all ducts and air handler leaks).
  - c. Damper off the return system in the heaviest work areas and seal the return system openings with plastic.
  - d. Upgrade the filter efficiency where major loading is expected to affect operating HVAC system.
  - e. Clean permanent return air ductwork per National Air Duct Cleaning Association standards upon completion of all construction and finish installation work.
  - f. Replace all filtration media prior to occupancy.
2. Source Control: Propose the substitution of non-toxic formulations of materials that are generally the responsibility of the contractor such as caulks, sealants, and cleaning products.
3. Pathway Interruption: Prevent contamination of clean spaces. Include the following strategies that apply:
  - a. Use 100 percent outside air ventilation (when outside temperatures are between 55 deg F and 85 deg F and humidity is between 30 percent and 60 percent) with air exhausted directly to the outside during installation of finishes and other VOC emitting materials.
  - b. Erect some type of barrier between work areas or between the inside and outside of the building to prevent unwanted airflow from dirty to clean areas.
4. Housekeeping: Reduce construction contamination in the building prior to occupancy through HVAC and regular space cleaning activities.
  - a. Store building materials in a weather tight, clean area prior to unpacking for installation.
  - b. Check for possible damage to building materials from high humidity.
  - c. Clean all coils, air filters, and fans before testing and balancing procedures are performed.
5. Scheduling: Specify construction sequencing to reduce absorption of VOC's by materials that act as sinks or contaminant sources. Complete application of wet and odor-emitting materials such as paints, sealants, and coatings before installing sink materials such as ceiling tiles, carpets, insulation, gypsum products, and fabric-covered furnishings are installed.
  - a. Protect stored on-site or installed absorptive materials from exposure to moisture through precipitation, plumbing leaks, or condensation from the HVAC system to prevent microbial contamination.

- C. Draft IAQ Management Plan Review Meeting: Once the Owner and Architect have reviewed the Draft IAQ Management Plan and prior to construction at the site, schedule and conduct a meeting to review the Draft IAQ Management Plan and discuss procedures, schedules and specific requirements for IAQ during the construction and pre-construction phases of the building. Discuss coordination and interface between the Contractor and other construction activities. Identify and resolve problems with compliance to the requirements. Record minutes of the meeting, identify all conclusions reached and matters requiring further resolution.
  - 1. Attendees: The Contractor and related Contractor personnel associated with the work of this section, including personnel to be in charge of the IAQ management program, Architect, Owner and such additional personnel as the Architect or Owner deem appropriate.
- D. Final IAQ Management Plan: Make any revisions to the Draft IAQ Management Plan agreed upon during the meeting identified in item (C) above and incorporate resolutions agreed to be made subsequent to the meeting. Submit the revised plan to the Owner and Architect for approval within 10 calendar days of the meeting.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 IMPLEMENTATION OF IAQ MANAGEMENT PLAN

- A. Manager: The Contractor shall designate an on-site party (or parties) responsible for instructing workers and overseeing and the IAQ Management Plan for the Project.
- B. Progress Meetings: Construction related IAQ procedures shall be included in the pre-construction and construction progress meeting agendas.
- C. Distribution: The Contractor shall distribute copies of the IAQ Management Plan to the Job Site Foreman, each Subcontractor, the Owner, and the Architect.
- D. Instruction: The Contractor shall provide on-site instruction of the IAQ procedures and ensure that all participants in the construction process understand the importance of the goals of the IAQ Management Plan.

END OF SECTION

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## SECTION 01 60 00 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
  - 1. Section 01 10 00 "Summary" for Contractor requirements related to Owner-furnished products.
  - 2. Section 01 25 00 "Substitution Procedures" for requests for substitutions.
  - 3. Section 01 42 00 "References" for applicable industry standards for products specified.
  - 4. Section 01 77 00 "Closeout Procedures" for submitting warranties.

#### 1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
  - 1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure.
- D. Comparable Product Request Submittal: A submittal requesting consideration of a comparable product, including the following information:
  - 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
  - 2. Data indicating compliance with the requirements specified in Part 2 "Products" Articles.
- E. Basis-of-Design Product Specification Submittal: A submittal complying with requirements in Section 01 33 00 "Submittal Procedures."
- F. Substitution: Refer to Section 01 25 00 "Substitution Procedures" for definition and limitations on substitutions.

#### 1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
  - 1. Resolution of Compatibility Disputes between Multiple Contractors:
    - a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
    - b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
  - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
  - 2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
    - a. Name of product and manufacturer.
    - b. Model and serial number.
    - c. Capacity.
    - d. Speed.
    - e. Ratings.
  - 3. See individual identification Sections in Divisions 21, 22, 23, 26, 27, and 28 for additional equipment identification requirements.

#### 1.5 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

#### 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

#### 1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
  - 1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
  - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.

- B. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
  4. Where products are accompanied by the term "as selected," Architect will make selection.
  5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
  6. For products specified by name and accompanied by the term "approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
    - a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "approved" product status is by the Architect, whose determination is final.
- B. Product Selection Procedures:
1. Approved Manufacturers and Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements.
    - a. Approved manufacturers and products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
    - b. For approval of unspecified manufacturers or products, comply with requirements in Section 01 25 00 "Substitution Procedures" for substitutions for convenience.
  2. Available Manufacturers and Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.
    - a. Available manufacturers and products are indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
    - b. For Available Manufacturers and Products: Provision of an unnamed manufacturer or product is not considered a substitution, if the product complies with requirements.
  3. Basis-of-Design Manufacturers and Products: Where Specifications name a manufacturers or product, or refer to a manufacturer or product indicated in Drawings, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
    - a. For approval of unspecified manufacturers or products, comply with requirements in

Section 01 25 00 "Substitution Procedures" for substitutions for convenience.

- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
  - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, texture, or other similar characteristic from manufacturer's product line that includes both standard and premium items.

## 2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
  - 1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
  - 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
  - 3. Evidence that proposed product provides specified warranty.
  - 4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
  - 5. Samples, if requested.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 01 33 00 "Submittal Procedures."
  - 1. Form of Approval of Submittal: As specified in Section 01 33 00 "Submittal Procedures."
  - 2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.
  - 1. When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

## PART 3 - EXECUTION (NOT USED)

END OF SECTION

Coaledo & Sumner Halls											Permit and Bid Documents
Project # 4859-01											Finish and Material Legend
											3-Mar-23
DIVNUM	DIVISION	SECTION	KEY	NAME	MANUFACTURER	STYLE	COALEDO COLOR	COALEDO FINISH	SUMNER COLOR	SUMNER FINISH	NOTES
02	EXISTING CONDITIONS										
03	CONCRETE										
		03 33 00	Cast-in-Place Concrete								
			CONC-1	CIP		Patch & repair existing slab					Coaledo - Floor trench infill
			(E) CONC	Existing Concrete							
		03 54 13	Gypsum Cement Underlayment								
				Gypsum Cement Underlayment	1.Basis-of-Design Product: <a href="#">Treadstone Elite by formulated materials LLC.; www.formulatedmaterials.com.</a> 2.Other Approved Manufacturers: <a href="#">a.USG Corp.; www.usg.com.</a> <a href="#">b.Or approved substitution.</a>						
05	METALS										
		05 50 00	Metal Fabrications								
				Steel framing and supports for mechanical and electrical equipment							
				Steel framing and supports for applications where framing and supports are not specified in other Sections.							
				Slotted channel framing for re-configurable structures (Unistrut).							
06	WOOD										
		06 16 00	Sheathing								
				Exterior Wall Sheathing	<a href="#">a.DensGlass Sheathing by Georgia-Pacific Gypsum, LLC.; www.buildgp.com.</a> <a href="#">b.Securock Glass-Mat Sheathing, Regular and Firecode X by USG Corp.; www.usg.com.</a> <a href="#">c.GlasRoc Sheathing by Certainteed; www.certainteed.com.</a>	Type X, 5/8 inch thick. Size: 48 by 96 inches for vertical installation.					
				Wall sheathing.	DOC PS1, APA Rated Exposure 1, Structural 1 sheathing; FR treated within 48 inches of fire walls.	1.Span Rating: Not less than 32/16. 2.Nominal Thickness: Not less than 15/32 inch.					
		06 20 13	Exterior Finish Carpentry								
			WT-1	Exterior Wood Trim		1.Species: Douglas fir (Pseudotsuga menziesii). 2.Profile: Tongue-and-groove (T&G). 3.Size: 2 x 6 inches nominal, or as indicated. 4.Face Surface: Sanded.					
		06 20 23	Interior Finish Carpentry								
			PWP-1	Plywood Wall Paneling	Soelberg	Rotto	-	Baltic Birch, Clear Finish	-	-	Coaledo - Wall Paneling
			WD-1	Veneer	-	Rift-Sawn White Oak	-	-	-	Clear	
			WD-2	Solid Stock	-	Rift-Sawn White Oak	-	-	-	Clear	
			WD-3	Veneer	-	Bigleaf Maple	-	Clear	-	-	
			WD-4	Solid Stock	-	Bigleaf Maple	-	Clear	-	-	
			UPH-1	Upholstery	Momentum	Canter EPU, 100% EPU Polyurethane, 54" wide	-	-	Night	-	Built-in Bench - Seat
			UPH-2	Upholstery	Pallas Textiles	Utopia, 39% Recycled Solution Dyed Nylon, 36% Rayon, 25% Polyester	-	-	Denim	-	Built-in Bench - Back
		06 41 00	Architectural Casework								
			PLAM-1	Plastic Laminate	Wilsonart	High Pressure Laminate	-	-	Mission Maple	Matte	Casework - Base Cabinets
			PLAM-2	Plastic Laminate	Wilsonart	High Pressure Laminate	-	-	Linen	Matte	Casework - Upper Cabinets
			PLAM-3	Plastic Laminate	Pionite	High Pressure Laminate	-	-	Cinder Gray Concrete	Textured/ Suede (SD)	Casework - Counters - Control Rooms, Upper Cabinets- Sumner Lab prep.
			PLAM-4	Plastic Laminate	Wilsonart	High Pressure Laminate	New Age Oak	Matte	-	-	Casework - Base and Upper Cabinets
			PLAM-5	Plastic Laminate	Fenix	High Pressure Laminate, 0.8 mm	Castoro Ottawa	-	-	-	Display Case Interior
			PLAM-6	Plastic Laminate	To Be Selected	High Pressure Laminate	To Be Selected	Matte	To Be Selected	Matte	Restroom - Removable Panel
			SURF-1	Solid Surface	Wilsonart	Solid Surface	-	-	Coconut Oil	-	Casework - Counters
			SURF-2	Solid Surface	Corian	Solid Surface	-	-	Canvas	-	Restroom Counters
			SURF-3	Solid Surface	Corian	Solid Surface	Doeskin	-	-	-	Work Room - Counters
			SURF-4	Solid Surface	Corian	Solid Surface	Neutral Concrete	-	-	-	Restroom Counters
			SURF-5	Epoxy Top	Durcon	-	Graphite	-	-	-	Forestry Lab - Counters

			SS-1	Stainless Steel	<a href="#">1.Air Master Systems, Corp: www.airmastersystems.com.</a> <a href="#">2.Bedcolab: www.bedcolab.com.</a> <a href="#">3.CiF Lab Solutions LP: www.cifsolutions.com.</a> <a href="#">4.ICIsScientific: www.iciscientific.com.</a> <a href="#">5.Kewaunee International Group: www.kewaunee.com.</a> <a href="#">6.Mott Manufacturing Ltd. &amp; Mott Manufacturing LLC: www.mott.ca.</a>	14 Gauge, 304 Grade	-	No. 4 Finish	-	No. 4 Finish	Lab Prep - Counters
			HDWR-1	Closet Rod & Brackets	Knape & Vogt	770 5 Series Extra-Duty Round Closet Rod & Brackets	-	Chrome			Coaledo - lab prep - wader storage
			HDWR-2	Shelf Standards & Brackets	Knape & Vogt	85 Series Standards (36" H), 185 Series Brackets	White	-			Coaledo- lab prep. shelving
			HDWR-3	Sliding Glass Door Hardware	Knape & Vogt	Roll-Ezy Ball Bearing Track System and Sliding Glass Door Lock	-	Zinc plated steel			Coaledo - hall display cases
			HDWR-4	Display Case Shelf Hardware	Doug Mockett	SH15C Set, C-Style tracks and brackets, sizes as indicated in details	-	Satin Aluminum	-	-	Coaledo - hall display cases
			HDWR-5	Grommet	Doug Mockett	MM6/ Set, 2 1/2" solid brass cap & liner set	-	-	-	Satin Chrome (26D)	Sumner- Control Room
			HDWR-6	Trash Grommet	Doug Mockett	TM2C, 8" diameter, 3" deep	-	-	-	Satin Stainless Steel (SSS)	Sumner- Dental Work Room
			MWR-1	Millwork Reveal	Fry Reglet	Millwork Channel L - Angle W/ Return Key, MWCL100, 1" deep	Platinum 1008	Powder Coat	-	-	Coaledo - with cork tack panel AWP-2
<b>07 CLADDING</b>											
		<b>07 21 00</b>	<b>Thermal Insulation</b>								
			INSUL-1	Batt Insulation, mineral wool, unfaced	<a href="#">Basis-of-Design Product: Comfortbatt by Rockwool (formerly Roxul): www.rockwool.com.</a>						Applications: Provide at exterior wall cavities; as indicated on Drawings.
			INSUL-2	Glass-fiber blanket insulation	<a href="#">1.Approved Products: a.Formaldehyde-Free Fiberglass Insulation by Johns Manville: www.johnsmanville.com.</a> <a href="#">b.EcoBatt (Unfaced) by Knauf: www.knaufinsulation.us.</a> <a href="#">c.EcoTouch Pink Fiberglas Insulation by Owens Corning: www.owenscorning.com.</a>	Unfaced: ASTM C665, Type I; passing ASTM E136 for combustion characteristics; R-3.2 per inch. No added formaldehyde					Application: As indicated on Drawings.
			VB-1	Vapor retarder	<a href="#">MemBrain by CertainTeed, Div. of Saint Gobain: www.certainteed.com.</a>						Application: Interior face of wood framed exterior walls and roofs.
		<b>07 27 13</b>	<b>Weather Barriers</b>		<a href="#">A.Basis-of-Design Manufacturer: Prosoco, Inc.: www.prosoco.com.</a> <a href="#">B.Other Approved Manufacturers: 1.Soprema: www.soprema.us.</a> <a href="#">2.Tremco, Inc.: www.tremcosealants.com.</a>						
			WRB-1	Vapor-permeable membrane air barrier	Basis of Design Product: R-Guard Cat 5 by Prosoco.  Other Approved Products: 1.Sopraseal LM 204 VP by Soprema. 2.ExoAir 230 by Tremco, Inc	Single-component, silyl-terminated-polymer (STP); roller-applied to produce a highly durable, seamless, elastomeric weatherproofing membrane. May be applied in unfavorable weather conditions to dry or damp surfaces.					
			SAM-1	Self-adhered transition membranes	<a href="#">a.Basis of Design Product: Wrapshield SA Self-Adhered by Vaproshield: www.vaproshield.com.</a>						Application: Membrane flashings for transition applications where sealants WILL NOT be in contact with the transition membrane
			SAM-2	High Temperature, Foil-Faced Transition Membrane (Foil-Face Transition)	<a href="#">a.Basis of Design Product: R-Guard SS ThruWall by Prosoco.</a> <a href="#">b.Other Approved Product: Vapro SS Flashing by Vaproshield: www.vaproshield.com.</a>	Butyl, 45 mil thick, self-adhering composite sheet consisting of butyl laminated to high-density polyethylene (HDPE) film laminated to an aluminum foil; coated on one side with a high-temperature recycled butyl adhesive.					Applications: Membrane flashings for transition applications where sealants WILL be in contact with the transition membrane, for proper adhesion.

			SAM-3	High Temperature, Transition Membrane (Hi-Temp Transition)	<a href="#">Basis of Design Product: Grace Ultra by GCP Applied Technologies; www.gcpat.com.</a>	Butyl, 24 mil thick, self-adhering composite sheet consisting of butyl laminated to high-density polyethylene (HDPE) film; coated on one side with a high temperature recycled butyl adhesive.					
			F-5	Liquid-Applied Flashing Membrane	Basis of Design Product: R-Guard FastFlash by Prosoco.	Single-component, silyl-terminated-polymer (STP) waterproofing, adhesive and detailing compound for seamless, elastomeric flashing membrane. Use to adhere, transition and counter-flash through-wall sheet flashing.					
		07 46 46	Fiber-Cement Siding								
			FCP-1	Fiber-cement siding for exterior applications	Large Smooth Panel Siding by James Hardie	Texture: Smooth. Exposed Width: As selected by Architect. Thickness: 5/16-inch. Color: As selected by Architect. Installation Orientation: Vertical Applications: As indicated					
				Cladding support system, including insect screen	Insect Screens: Glass-Fiber Mesh Fabric: Mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D3656.	Mesh Color: Black.					
		07 54 23	THERMOPLASTIC POLYOLEFIN (TPO) ROOFING		<a href="#">B.Basis-of-Design Manufacturer: Firestone Building Products Co.; www.firestonebpco.com.</a> <a href="#">C.Other Acceptable Manufacturer: Subject to compliance with requirements, provide TPO roofing systems by the following manufacturers:</a> <a href="#">1.Carlsle SynTec Systems; www.carlslesyntec.com.</a> <a href="#">2.Johns Manville; www.jm.com.</a>						
			TPO-1	Fully adhered TPO (thermoplastic polyolefin) roofing system	1.Basis-of-Design Product: UltraPly TPO System by Firestone.	Thickness: 60 mils, nominal. Exposed Face Color: Gray.					
			VB-3	Vapor retarder	1.Basis-of-Design Product: V-Force Vapor Barrier Membrane by Firestone Building Products Co.						

		07 62 00	Sheet Metal Flashing								
				Formed copings.							
				Manufactured reglets.							
				Formed wall flashing and trim.							
				Formed low-slope roof flashing and trim.							
				Roof drainage sheet metal fabrications and downspouts.							
				Flashing at door and window openings.							
				Formed overhead piping safety pans.							
				Polymethyl-methacrylate (PMMA) gutter liner.							
		07 92 00	Joint Sealants		<a href="http://www.master-builders-solutions.basf.us">1.BASF Corp.: www.master-builders-solutions.basf.us.</a> <a href="http://www.dow.com">2.Dow Corp.: www.dow.com.</a> <a href="http://www.siliconeforbuilding.com">3.GE Construction Sealants: www.siliconeforbuilding.com.</a> <a href="http://www.pecora.com">4.Pecora Corp.: www.pecora.com.</a> <a href="http://www.sika.com">5.Sika Corp.: www.sika.com.</a> <a href="http://www.tremco.com">6.Tremco, Inc.: www.tremcosealants.com.</a>						
			SILICONE JOINT SEALANTS								
				Silicone, S, NS, 100/50, NT	1.Basis-of-Design Product: Spectrem 1 by Tremco, Inc. 2.Other Approved Products: a.Dowsil 790 Silicone Building Sealant by Dow Corp. b.Pecora 890 NST by Pecora Corp.						Applications: Non-porous dissimilar exterior materials, as indicated in Drawings.
				Silicone, S, NS, 50, NT	1.Basis-of-Design Product: Dowsil 756 SMS Building Sealant by Dow Corp. 2.Other Approved Product: Pecora AVB by Pecora Corp.						<b>Applications: Above-grade expansion and control joints, as indicated in Drawings.</b>
				Silicone, S, NS, 25, NT	1.Basis-of-Design Products: Dowsil 758 Silicone Building Sealant by Dow Corp. 2.Other Approved Product: Pecora AVB by Pecora Corp.						Applications: Weather barrier to flashings, above-grade joints, as indicated in Drawings.
				Silicone, S, P, 100/50, T, NT	1.Basis-of-Design Product: Spectrem 900SL by Tremco, Inc. 2.Other Approved Product: Pecora 301 SL by Pecora Corp.						Applications: Horizontal joints, As indicated in Drawings.
				Silicone, S, P, 25, T, NT	1.Basis-of-Design Product: Sikasil GP by Sika Corp.						Applications: Porous exterior materials, as indicated in Drawings.
			NONSTAINING SILICONE JOINT SEALANTS								
				Silicone, Nonstaining, S, NS, 100/50, NT	1.Basis-of-Design Product: Spectrem 1 by Tremco, Inc. 2.Other Approved Products: a.Dowsil 790 Silicone Building Sealant by Dow Corp. b.Pecora 890 NST by Pecora Corp.						Applications: As indicated in Drawings.
				Silicone, Nonstaining, S, NS, 50, NT	1.Basis-of-Design Product: Spectrem 3 by Tremco, Inc. 2.Other Approved Products: a.Dowsil 795 Silicone Building Sealant by Dow Corp. b.Pecora 895 NST by Pecora Corp.						Applications: At expansion and control joints, precast concrete panel joints, perimeter caulking, and aluminum.
				Silicone, Nonstaining, M, NS, 50, NT	1.Basis-of-Design Product: Spectrem 4TS by Tremco, Inc.						Applications: As indicated in Drawings.



			URETHANE JOINT SEALANTS								
				Urethane, S, NS, 25, T, NT	1.Basis-of-Design Product: Dymonic FC by Tremco, Inc. 2.Other Approved Manufacturer: BASF Corp.						Applications: As indicated in Drawings.
				Urethane, S, NS, 100/50, T, NT	1.Basis-of-Design Product: Dymonic 100 by Tremco, Inc. 2.Other Approved Manufacturer: Sika Corp.						Applications: At expansion and control joints, precast concrete panel joints, perimeter caulking, and aluminum, as indicated in Drawings.
				Urethane, M, NS, 50, NT	1.Basis-of-Design Product: Dymeric 240FC by Tremco, Inc. 2.Other Approved Product: Pecora DynaTrol II by Pecora Corp.						Applications: Exterior paintable surfaces and exterior and interior horizontal concrete joints, as indicated in Drawings.
				Urethane, M, NS, 25, NT	1.Basis-of-Design Product: THC-901 by Tremco, Inc. 2.Other Approved Product: Pecora Dynatred by Pecora Corp.						Applications: General, and as indicated in Drawings.
				Urethane, M, P, 50, T, NT	<a href="#">1.Basis-of-Design Manufacturer: LymTal International Inc.; www.lymtal.com.</a>						Applications: Exterior paintable surfaces and exterior and interior horizontal concrete joints.
				Urethane, M, P, 25, T, NT	1.Basis-of-Design Product: Pecora Dynatrol II SG by Pecora Corp.						Applications: As indicated in Drawings.
			IMMERSIBLE JOINT SEALANTS								
				Urethane, Immersible, S, NS, 100/50, NT, I	1.Basis-of-Design Product: Vulkem 45 SSL by Tremco, Inc.						Applications: As indicated in Drawings.
				Urethane, Immersible, S, NS, 50, T, NT, I	1.Basis-of-Design Product: Dymonic 100 by Tremco, Inc.						Applications: As indicated in Drawings.
			SILYL-TERMINATED POLYETHER (STPE) JOINT SEALANTS								
				STPE, S, NS, 50, NT	1.Basis-of-Design Product: Pecora Dynatrol I-XL Hybrid by Pecora Corp.						Applications: As indicated in Drawings.
				STPE, S, NS, 100/50, T, NT	1.Basis-of-Design Product: MasterSeal NP 150 Sealant or NP 150 Tint Base Sealant by Master Builders Solutions, formerly BASF.						Applications: Where exterior, paintable sealant is required.
			MILDEW-RESISTANT JOINT SEALANTS								
				Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT	1.Basis-of-Design Product: Tremsil 200by Tremco, Inc. 2.Other Approved Manufacturers: a.Dowsil 786 Silicone Sealant by Dow Corp. b.GE Construction Sealants. c.Sika Corp.						Applications: At joints in ceramic tile walls and floor, around equipment and around plumbing fixtures, as indicated in Drawings.
			BUTYL JOINT SEALANTS								
				Butyl-Rubber-Based Joint Sealants	1.Basis of Design Product: Tremco Butyl by Tremco, Inc. 2.Other Approved Product: Pecora BC-158 by Pecora Corp.						Applications: As indicated in Drawings.
				Acoustical/Curtainwall Sealant	1.Basis of Design Product: Acoustical/Curtainwall Sealant by Tremco, Inc. 2.Other Approved Product: Pecora AC-20 FTR by Pecora Corp.						Applications: At curtainwall joints, metal panel joining, bedding thresholds, secondary glazing seals, and areas where a seal is required against TPO gaskets, as indicated in Drawings.
			LATEX JOINT SEALANTS								
				Acrylic Latex: Acrylic latex or siliconized acrylic latex	1.Basis-of-Design Product: Tremflex 834 by Tremco, Inc. 2.Other Approved Product: Pecora AC-20 +Silicone by Pecora Corp.						Applications: At interior door frames to walls, as indicated in Drawings.

08 DOORS											
		08 11 14	Hollow Metal Doors								
			HM-1	Hollow Metal Door	<a href="#">1.Ceco brand associated with AADG, Inc., an ASSA ABLOY Group company; www.cecodoor.com.</a> <a href="#">2.Curries brand associated with AADG, Inc., an ASSA ABLOY Group company; www.curries.com.</a> <a href="#">3.Steelcraft a division of Allegion plc; www.steelcraft.com.</a>	Exposed Finish: Factory primed for field-finishing.					
			HM	Hollow Metal Frame		Standard-Duty Frames: SDI A250.8, Level 1. At interior locations as scheduled  Physical Performance: Level C according to SDI A250.4. Exposed Finish: Factory primed for field-finishing.					
		08 14 16	Flush Wood Doors								
			WD	Flush Wood Doors		1.Species: As selected by Architect. 2.Grade: Premium Grade AA. 3.Finish: Clear. 4.Core: Either glued or nonglued block or structural composite lumber. 5.Application: As indicated on Drawings. 6. STC Rating 49.					
			WD-1	Flush Wood Door		Plain-Sawn White Oak	-	-	-	Clear	
			WD-2	Flush Wood Door		Plain-Sawn Maple	-	Clear	-	-	
			WD-3	Existing Doors to Remain		Existing to Remain, remove existing finish & provide new clear finish	-	-	-	Clear	
		08 31 13									
			Access Doors and Frames								
			AP-1	Wall access doors and frames	<a href="#">Bauco Plus II by Bauco Access Panel Solutions, Inc.; www.accesspanelsolutiuons.com.</a>	a.Size: 24 x 24 inches. Finish: Primed for field painting, match adjacent walls or ceiling as approved by Architect.					
			AP-2 and AP-3	Wall access doors and frames	<a href="#">Fire Rated Wall Access Door from FR Series by Elmdor Stoneman; www.elmdorstoneman.com.</a>	a.Sizes: 1)AP-2: 24 x 24 inches. 2)AP-3: 24 x 36 inches. Finish: Primed for field painting, match adjacent walls or ceiling as approved by Architect.					
				Recessed Access Doors and Trimless Frames: Fabricated from metallic-coated steel or stainless-steel sheet.		Size: 12 inch x 12 inch, 16 inch x 16 inch, 30 inch x 30 inch and as indicated. Finish: Primed for field painting, match adjacent walls or ceiling as approved by Architect.					

		08 41 13									
			Aluminum-Framed Entrances and Storefronts		<a href="#">B.Basis-of-Design Manufacturer: Kawneer North America; www.kawneer.com.</a> <a href="#">C.Other Approved Manufacturers:</a> <a href="#">1.Arcadia Inc; www.arcadiainc.com.</a> <a href="#">2.EFCO Corp; www.efcocorp.com.</a> <a href="#">3.Starline Windows; www.starlinewindows.com.</a> <a href="#">4.Wausau; www.wausauwindow.com.</a>	B.Aluminum Finish: Provide high-performance organic finish. 1.High-Performance Organic Finish: Two- or three- coat fluoropolymer finish complying with AAMA 2604 or AAMA 2605 and containing not less than 70 percent PVDF or FEVE resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions. a.Basis-of-Design Product: Permafluor Architectural Coating by Kawneer. 2.Color: As selected by Architect from manufacturer's full range.					
			SF-1	Aluminum Storefront System	Trifab VersaGlaze (VG) 451T Framing System (Thermal) by Kawneer.						
				Entrance Door	Model 500, Non-Thermal Entrance Door by Kawneer.						
			IMP-1	Insulated Metal Panel				-	-		Lower panels in Coaledo Storefronts
		08 80 00	Glazing								
					<a href="#">1.AGC Glass North America; www.agcglass.com.</a> <a href="#">2.Oldcastle Building Envelope; www.obe.com.</a> <a href="#">3.Pilkington, a div. of Nippon Sheet Glass Co., Ltd; www.pilkington.com.</a>						
			GL-1	One-way glass for interior relite							Sumner Paramedicine Control Rooms
			IGU-1	Exterior clear insulated glazing unit (IGU), safety glazing	<a href="#">Solarban 60 by Vitro Architectural Glass; www.vitroglazings.com.</a>	1.Overall Unit Thickness: 1 inch: a.Outer Lite: 1/4 inch clear float glass, with low-emissivity (low-E) coating on no. 2 surface. b.Inner Lite: Fully tempered 1/4 inch clear float glass.			-	-	
			IGU-2	Exterior clear insulated glazing unit (IGU), general use	<a href="#">1)Basis-of-Design Product, Low-E Coating: Solarban 60 by Vitro Architectural Glass; www.vitroglazings.com.</a>	1.Overall Unit Thickness: 1 inch: a.Outer Lite: 1/4 inch clear float glass, with low-emissivity (low-E) coating on no. 2 surface. b.Inner Lite: Fully tempered 1/4 inch clear float glass.			-	-	
			MR-1	Mirror Glass	<a href="#">1.Silvered Flat Glass Mirrors, Acceptable Manufacturers:</a> <a href="#">a.Gilded Mirrors, Inc.; www.gildedmirrorsinc.com.</a> <a href="#">b.Walker Glass Co., Ltd.; www.walkerglass.com.</a> <a href="#">2.Mirror Mastic, Acceptable Manufacturers:</a> <a href="#">a.Franklin Intl.; www.titebond.com.</a> <a href="#">b.C.R. Laurence, Co., Inc.; www.crlaurence.com</a> <a href="#">c.Macco Adhesives; www.liquidnails.com.</a> <a href="#">d.OSI Sealants, Inc.; www.ositough.com.</a> <a href="#">e.Palmer Products Corp.; www.mirro-mastic.com.</a> <a href="#">f.Pecora Corp.; www.pecora.com.</a> <a href="#">g.Royal Adhesives &amp; Sealants; www.royaladhesives.com</a>						
			CTG-1	Structural, monolithic, clear interior tempered glazing.		1.Lite: 1/4 inch clear float glass.					
			CTG-2	Structural, monolithic, clear interior tempered glazing.		1.Lite: 1/2 inch clear float glass.					

		08 91 19	Fixed Louvers								
			LV-1	Fixed, extruded-aluminum louvers	<a href="#">1.Airolite Company, LLC: www.airolite.com.</a> <a href="#">2.Construction Specialties, Inc.: www.c-sgroup.com.</a> <a href="#">3.Greenheck Fan Corp.: www.greenheck.com.</a> <a href="#">4.Ruskin Co.: www.ruskin.com.</a>	B5157 by Construction Specialties (C/S) Group.  1. Louver Depth: 5 inches.	To Match Exterior Window System	-	-	-	
09	FINISHES										
		09 26 13	Gypsum Veneer Plastering	High-Strength, One-Component Gypsum Veneer Plaster	Acoustical Plaster Finish by USG.	ready-mixed, smooth, finish-coat veneer plaster containing mill-mixed, fine silica sand; with a compressive strength of 3000 psi when tested according to ASTM C472					
		09 29 00	Gypsum Board								
			GWB-1	Gypsum Wall Board	<a href="#">American Gypsum Company, LLC: www.americangypsum.com.</a>	5/8 inch, Type X					
			GWB-2	Gypsum Wall Board	Not Used						
			GWB-3	Water Resistant Gypsum Backing Board	<a href="#">American Gypsum Company, LLC: www.americangypsum.com.</a>	5/8 inch, Type X AquaBloc.					
			GWB-4	Ceramic Tile Backing Board	USG Durock GlasMat						
			MC-1	Mullion Trim Cap	<a href="#">Mull It Over: www.mullitoverproducts.com</a>	Mull-It-Over 55 - Classic	To match the adjacent wall	-	-		
			DR-1	Drywall Reveal	Fry Reglet	Drywall F Reveal   DRMF, 5/8" x 1/2"	Buffed Brite Stainless Steel				Column to gypsum board
		09 30 00	Tiling								
			PT-1	Porcelain Tile	DalTile	Keystones, square, 2" x 2", straight joint, including build up base and build up cove base for gyp. or wall tile above, 1/8" grout joint	-	-	D200 Desert Gray Speckle	Matte	Sumner, floor tile
			GRT-1	Grout	Custom Building Products, Mapei or approved equal	Sanded, for use with PT-1, including grout sealer. Custom Building Products Polyblend Plus Sanded Grout, Mapei Keracolor S or approved equal	-	-	To be selected from manufacturer's standard colors	-	Sumner, floor tile
			PT-2	Porcelain Tile	Emser Tile	Mixt, Mineral, 12" x 24", running bond layout with 1/3 offset, 1/8" grout joint, Schluter DITRA uncoupling membrane, thickset	Greige	Matte	-	-	Coaledo, floor tile
			GRT-2	Grout	Custom Building Products, Mapei or approved equal	Sanded, for use with PT-2, including grout sealer. Custom Building Products Polyblend Plus Sanded Grout, Mapei Keracolor S or approved equal	To be selected from manufacturer's standard colors	-	-	-	Coaledo, floor tile
			PT-3	Porcelain Tile	Emser Tile	Fixt, Cement, 12" x 24", stacked bond layout, 1/8" grout joint	White	Matte	-	-	Coaledo, wall tile
			GRT-3	Grout	Custom Building Products, Mapei or approved equal	Sanded, for use with PT-3, including grout sealer. Custom Building Products Polyblend Plus Sanded Grout, Mapei Keracolor S or approved equal	To be selected from manufacturer's standard colors	-	-	-	Coaledo, wall tile
			CT-1	Ceramic Tile	DalTile	Color Wheel Classic 3" X 6" Wall tile, including bullnose top edge trim	-	-	K175 Biscuit	Glossy	Sumner, wall tile  We've incorporated these changes into the specs. -CM/MTA 02/22
			GRT-4	Grout	Custom Building Products, Mapei or approved equal	Unsanded, for use with CT-1, including grout sealer. Custom Building Products Ployblend Plus Non-Sanded Grout, Mapei Keracolor U or approved equal	-	-	To be selected from manufacturer's standard colors	-	
			TRANS-3	Transition, PT to RF	Schluter	To Be Selected	-	-	To be selected from manufacturer's standard colors	-	Sumner
			TRANS-4	Transition, Cove Base	Schluter	DILEX-AHK Cove Base, aluminum	-	Satin Anodized	-	-	Coaledo, floor to wall tile transition
			TRANS-5	Transition, PT to (E) Brick or RF	Schluter	SCHIENE, V4A (stainless steel type 316)	-	stainless steel	-	stainless steel	Coaledo, Sumner
			TRANS-6	Transition, PT to (E) Concrete	Schluter	RENO-RAMP, aluminum	-	satin anodized	-	-	Coaledo
			TRANS-7	Transition, Top Edge of PT Wall Tile	Schluter	JOLLY, aluminum	-	brushed chrome anodized	-	-	Coaledo
			TRANS-11	Transition, PT to RF	Schluter	RENO-U, V2A (stainless steel type x)	-	-	-	brushed stainless steel	Sumner
		09 51 23	Acoustic Ceilings								
			ACT-1	Acoustical Ceiling Tile	Armstrong	Optima 3252, 24" x 48" X 1", square tegular, 15/16" grid	White	-	White	-	
			ACT-2	Acoustical Ceiling Tile	Armstrong	Health Zone Optima 3215PB, 24" x 48" x 1", square tegular, 15/16" grid	White	-	White	-	

		09 54 26	Linear Wood Ceilings								
			LWC-1	Linear Wood Ceiling	9Wood	1100 Series ceiling system, solid hemlock, vertical grain, with black duct liner, refer to details for member size and spacing	-	Clear	-	-	Coaledo
			LWCS-1	Linear Wood Ceiling Support	Armstrong or equal	Prelude XL 15/16" painted ceiling grid, main runners and cross tees, wall angle and hanger wire	Black	-	-	-	Coaledo
		09 65 00	Resilient Flooring								
			RF-1	Resilient Flooring	Tarkett	iQ Eminent, 6'-6" sheet goods, heat-welded seams with multi-color welding rod	-	-	883 Sand CB	-	Include floor prep/ patching compounds for existing slab.
			RF-2	Resilient Flooring	Tarkett	iQ Eminent Unisense, 6'-6" sheet goods, heat-welded seams with multi-color welding rod	908 Dusty Grey WG	-	-	-	Include floor prep/ patching compounds for existing slab. Forestry Lab, Forestry Classroom, Network Lab
			RF-3	Resilient Flooring	Tarkett	iQ Eminent, 6'-6" sheet goods, heat-welded seams with multi-color welding rod	870 Dark Warm Grey WG	-	-	-	Include floor prep/ patching compounds for existing slab. Forestry Lab Prep.
			RF-4	Resilient Flooring	Tarkett	iQ Granit, 6'-6" sheet goods, heat-welded seams with multi-color welding rod	752 Soft Sand Brown B	-	-	-	Include floor prep/ patching compounds for existing slab. Vestibules at hall
		09 65 13	Resilient Base and Accessories								
			RB-1	Rubber Base	Roppe	Pinnacle 5", standard toe at resilient, no toe at carpet	-	-	Smoke	-	
			RB-2	Rubber Base	Roppe	Pinnacle 4", standard toe at resilient, no toe at carpet	Smoke	-	Smoke	-	
			TRANS-1	Transition, RF to CPT	Johnsonite	SLT-XX-C, 0.08" to 1/4"	To be selected from manufacturer's standard colors	-	To be selected from manufacturer's standard colors	-	
			TRANS-2	Transition, RF to (E) CONC	Johnsonite	SLT-XX-J, 0.08" to subfloor	-	-	To be selected from manufacturer's standard colors	-	
			TRANS-9	Transition, RF to (E) brick at door	Tarkett	SSR-XX-B	To Be Selected	-	-	-	Coaledo
			TRANS-10	Transition, RF to (E) brick at alcove	Tarkett	SLT-XX-J	To Be Selected	-	-	-	Coaledo
		09 68 13	Carpeting								
			CPT-1	Carpet Tile	Interface	Ferris, 25 cm x 1 m, Backing: CQuestGB, Tac-Tile installation, Ashlar layout	-	-	Mushroom	-	Include floor prep/ patching compounds for existing slab. Sumner - lounge
			CPT-2	Carpet Tile	Interface	Mesa, 25 cm x 1 m, Backing: CQuestGB, Tac-Tile installation, Ashlar layout	-	-	Fog	-	Include floor prep/ patching compounds for existing slab. Sumner - offices, debrief, south classroom
			CPT-3	Carpet Tile	Interface	Eben, 25 cm x 1 m, Backing: CQuestGB, Tac-Tile installation, Ashlar layout	Oak	-	-	-	Include floor prep/ patching compounds for existing slab. Coaledo - lounge
			CPT-4	Carpet Tile	Interface	Mesa, 25 cm x 1 m, Backing: CQuestGB, Tac-Tile installation, Ashlar layout	Fern	-	-	-	Include floor prep/ patching compounds for existing slab. Coaledo - office suite, Computer Science lab
			WOM-1	Walk-Off Carpet	Vloer Commerical	Uberchique Tile, 19.69" x 19.69", full spread adhesive	Black Shadow	-	-	-	Include floor prep/ patching compounds for existing slab. Coaledo - vestibules
			TRANS-8	Transition, CPT to (E) brick	Tarkett	EG-XX-H edge guard	To Be Selected	-	-	-	Coaledo

		09 72 12	Fiberglass Reinforced Plastic Wall Covering								
			FRP-1	Fiber reinforced plastic Wall Protection	Crane Composites	Glas-Bord, Smooth	No. 85 "White".	-	No. 85 "White".	-	
		09 84 36	Sound Absorbing Units								
			AWP-1	Acoustical Wall Panel	Frame and Substrate: FabriTRAK, Fabric Finish: Maharam	Fabric wrapped, Acoustical, Tackable Panel, 1" square profile, FabriTACK infill, Fabric Finish: Method	-	-	Rhea	-	Sumner - Debrief Room
			AWP-2	Acoustical Wall Panel	Sustainable Materials	Muratto Organic Strips: STEP, cork panels 27" x 19" x 1/2"	Taupe	-	-	-	Coaledo - Meeting Room
			AB-1	Acoustical Ceiling Baffle	Turf	Torrent	-	-	26 Faded Denim	-	
			AB-2	Acoustical Ceiling Baffle	Turf	Plate	11 Celadon	-	-	-	
		09 91 00	Painting								
			P-1	Paint	Sherwin Williams	Product and Sheen per Specifications	Pure White	-	Pure White	-	General Wall Color - Eggshell Sheen
			P-2	Paint	Sherwin Williams	Product and Sheen per Specifications	High Reflective White	-	High Reflective White	-	Painted Gyp. Bd. Ceilings - Flat Sheen
			P-3	Paint	Sherwin Williams	Product and Sheen per Specifications	-	-	Debonair	-	Accent Paint Color - Eggshell Sheen
			P-4	Paint	Sherwin Williams	Product and Sheen per Specifications	Green Onyx	-	-	-	Accent Paint Color - Eggshell Sheen
			P-5	Paint	Sherwin Williams	Product and Sheen per Specifications	Iron Ore	-	-	-	Coaledo- exposed ceiling at hall above LWC
			P-10	Paint	Sherwin Williams	Product and Sheen per Specifications	Mindful Gray		Mindful Gray		Door Frames - Semi-Gloss Sheen
			P-15	Paint	Sherwin Williams	Product and Sheen per Specifications	TBD	-	-	-	Exterior Soffit
			P-16	Paint	Sherwin Williams	Product and Sheen per Specifications	-	-	TBD	-	Exterior Structure
			EP-1	Epoxy Paint	Sherwin Williams	Product and Sheen per Specifications	to match P-1	-	to match P-1	-	As indicated in Room Finish Schedule - Eggshell or Semi-Gloss Sheen
			EP-3	Epoxy Paint	Sherwin Williams	Product and Sheen per Specifications	-	-	to match P-3	-	As indicated in Room Finish Schedule - Eggshell or Semi-Gloss Sheen
		09 96 00	High Performance Coatings								We've included this section for coatings that shall be applied for all interior and exterior galvanized metals, Non-galvanized, wood, PT wood, Gypsum board, aluminum, concrete and nonferrous metals. - CM/MTA 02/01
			P-11	Powdercoat			Light gray, to be selected from manufacturer's standard colors.	-	-	-	Coaledo- refinishing of existing unit ventilators
10	SPECIALTIES										
		10 11 00	Visual Display Units								
			MB-1	Markerboard	Claridge or Platinum Visual Systems	Claridge or Platinum Visual Systems WRITANIUM MARKERBOARDS Framed unit with pen tray 4' x 8'	White	-	White	-	Sumner and Coaledo
			MB-2	Markerboard	Claridge or Platinum Visual Systems	Platinum Visual Systems Floor to Ceiling Markerboard System (FCS), Coordinate with millwork for solid wood trim	White	-	White	-	Sumner and Coaledo - lounges
			MB-3	Marker and Tack Wall	Claridge or approved equal	Cork Tack Wall, Marker Wall configured per interior elevation, with metal trim	-	-	Cork: TBD, Marker Board: White	-	Sumner - south hall
		10 14 23	Panel Signage								
			SIGN-1	Panel Signage							
		10 21 13	Toilet Compartments								
			TC-1	Toilet Compartments	Scranton	HDPE, floor-mounted, headrail-braced	Grey	Orange Peel	Grey	Orange Peel	
		10 26 00	Wall Protection								
			CG-1	Corner Guard		L-shape, 2" leg, heights as indicated in drawings	White	Powder Coat	White	Powder Coat	
			CG-2	Corner Guard		U-shape, 2" leg, 3'-7" H	White	Powder Coat	White	Powder Coat	
			CG-3	Corner Guard		L-shape, 2" leg, heights as indicated in drawings	-	Stainless Steel	-	-	Coaledo- exterior walls
			WP-1	Wall Protection	C/S Group	Acrovyn 4000 Sheet, .040" with aluminum trim pieces	-	-	Pearl	-	Sumner

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## SECTION 01 61 16 - DELEGATED DESIGN REQUIREMENTS

### 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. General: This Section specifies administrative and procedural requirements for delegated design indicated in the various Sections of these Specifications.
- B. Section Includes: Structural and other design requirements for delegated design components, otherwise known as fabricator-designed, bidder-designed or bidder design-build components.
- C. This Section applies to Technical Specification Sections, and supplements requirements indicated in the General and Supplementary Conditions.
- D. Delegated design does not mean deferred submittal. See Drawings for deferred submittals.
- E. Related Requirements:
  - 1. Refer to the following sections for specific delegated design requirements with deferred submittal:
    - a. Section 05 50 00 "Metal Fabrications" for equipment supports, ladders, and other applications where required by Code and not detailed in Structural Drawings.
    - b. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts".
    - c. Section 08 91 19 "Fixed Louvers".
    - d. Section 09 51 00 "Acoustical Panel Ceilings" for large areas of suspended ceiling where required by Code.
    - e. Section 09 54 26 "Linear Wood Walls and Ceilings" for large areas of suspended ceiling where required by Code.
    - f. Section 10 28 00 "Restroom and Custodial Accessories" for attachment of grab bars to structure.
    - g. Section 09 22 16 "Non-Structural Metal Framing".

#### 1.3 DEFINITIONS

- A. Contractor Design Requirements: Where occurs, same meaning as Delegated Design Requirements.
- B. Delegated Design Work: Design services and certifications provided by a Professional Engineer registered as such in the State where the Project is located related to systems, materials or equipment required for the Work to satisfy design and performance criteria established by the Contract Documents. Delegated Design does not include professional services the Contractor needs to fulfill their responsibilities under the Contract including but not limited to construction means, methods and sequence.
- C. Seal: Certification that builder design plans, computations and specifications were designed and prepared under the direct supervision of the Architect or Engineer whose name appears thereon.
- D. Approval Stamp: Certification obtained by the Contractor that the Building Official has reviewed a submittal, and finds it acceptable with respect to applicable regulatory requirements.
- E. Bidder-Design: Design services provided by an installer or manufacturer complying with quality

assurance, performance requirements and design requirements indicated and established by the Contract Documents. Bidder-design does not include Professional Engineering unless indicated otherwise.

#### 1.4 DELEGATED- AND BIDDER-DESIGN SERVICES

- A. Where referenced in these specifications, Delegated Design components and their attachments to the structure shall comply with the currently adopted edition of all applicable state and local ordinances, with parameters as specified in this individual sections.
- B. Where referenced in these specifications, Bidder-Design components and installation shall comply with the currently adopted edition of all applicable state and local ordinances, with parameters specified in this and individual sections.
- C. Permitting Agency Requirements: Follow the requirements for permits current at the time of submission. The General Contractor is responsible to coordinate and submit all material required, so the permitting agency's review will not adversely affect the construction schedule. At or near time of application, the General Contractor shall meet with the permitting agency to identify Delegated Design components and how they are to be submitted and processed for permits.
- D. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

#### 1.5 SUBMITTALS

- A. General: Submit complete Delegated Design Submittals to meet permitting agency requirements for permits. Include drawings and calculations for that portion of the Work signed and sealed by a State of Oregon registered engineer. Incomplete submittals or submittals not previously reviewed and so stamped by General Contractor will not be accepted for review by the Architect or Engineer of Record.
- B. These submittal requirements are in addition to other submittal requirements stated elsewhere in the contract documents.

#### 1.6 QUALITY ASSURANCE

- A. Where referenced in these specifications, Delegated Design components and their attachments to the structure shall comply with the currently adopted edition of all applicable state and local ordinances, with parameters as specified in this section.
- B. Permitting Agency Requirements: Follow the requirements for permits current at the time of submission. The General Contractor is responsible to coordinate and submit all material required, so the permitting agency's review will not adversely affect the construction schedule. At or near time of application, the General Contractor shall meet with the permitting agency to identify Delegated Design components and how they are to be submitted and processed for permits.

#### 1.7 INSURANCES

- A. Refer to General Conditions for Insurance and Bonds.

### PART 2 - PRODUCTS (NOT USED)

### PART 3 - EXECUTION

#### 3.1 WORK INCLUDED

- A. General: Certain of the components of the Work under this project are Delegated Design. It is

the General Contractor's responsibility to coordinate and assume or assign to subcontractors the complete responsibility for the design, calculations, submittals, fabrication, transportation and installation of the Delegated Design portions or components as required in this Section.

- B. The General Contractor is responsible to submit all documents required by the permitting agency for the separate approval and permit for each Delegated Design item. Delegated Design components of this Work are defined as complete, operational systems, provided for their intended use.
- C. All permit plan review and permit fees for Delegated Design items are the responsibility of the submitting General Contractor.

### 3.2 DOCUMENTS REQUIRED

- A. General: Delegated Design documents and related permits issuance must be completed prior to fabrication. The General Contractor must complete and submit a Contractor Design Summary Sheet listing Delegated Design Subcontractors and their registered engineer's names and phone numbers prior to submission of the Delegated Design documents for review.
- B. Scope of Documents: Delegated Design components are shown in the Contract Documents for design intent. The purpose is to have the General Contractor responsible to provide, coordinate and install each Delegated Design component.
  - 1. Delegated Design components attached to the structural frame or supplemental to the structural frame shall be designed for the anticipated loads as outlined in the Contract Documents. These Delegated Design components are all to be coordinated with appropriate subcontractors.
  - 2. Load reactions at the interface between the Delegated Design components and the structural frame shall be clearly defined to allow for a review by the Architect and Engineer of Record.
- C. Component Certification: Certify that mechanical and electrical components comply with the structural provisions of all applicable codes.
  - 1. Shop Drawings: Submit shop drawings for all attachments to the structure for all elements requiring structural design per these specifications. These attachments include, but are not limited to, structural bracing for equipment, conveyances, and architectural components; seismic restraints of vibration isolation systems; and details of lateral bracing and attachment systems designed to accommodate differential movement between building levels.
  - 2. Shop Drawings shall be sealed by the structural engineer responsible for their design.
- D. Quality Assurance Plan: Submit a quality assurance plan for the designated structural system of all elements requiring structural design per these specifications. Quality assurance plan shall comply with Owner's requirements and all applicable codes.

END OF SECTION

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## SECTION 01 73 00 - EXECUTION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Cutting and patching.
  - 4. Installation of the Work.
  - 5. Coordination of Owner's portion of the Work.
  - 6. Coordination of Owner-installed components.
  - 7. Progress cleaning.
  - 8. Starting and adjusting.
  - 9. Protection of installed construction.
  - 10. Correction of the Work.
- B. Related Requirements:
  - 1. Section 01 10 00 "Summary" for coordination of Owner-furnished products, Owner-performed work, and limits on use of Project site.
  - 2. Section 01 31 00 "Project Management and Coordination" for requirements for requests for information.
  - 3. Section 01 33 00 "Submittal Procedures" for submitting surveys.
  - 4. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
  - 5. Section 02 41 19 "Selective Demolition" for demolition and removal of selected portions of the building.
  - 6. Section 07 84 13 "Penetration Firestopping" for patching penetrations in fire-rated construction.

#### 1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

#### 1.4 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site.
  - 1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
    - a. Contractor's superintendent.
    - b. Trade supervisors responsible for cutting operations.
    - c. Trade supervisors responsible for patching of each type of substrate.
    - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
  - 2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- B. Layout Conference: Conduct conference at Project site.
  - 1. Prior to establishing layout of new and existing perimeter and structural column grid(s), review building location requirements. Review benchmark, control point, and layout and dimension requirements. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:
    - a. Contractor's superintendent.
    - b. Individual responsible for performing Project surveying and layout.
    - c. Individual responsible for performing site survey serving as basis for Project design.
  - 2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
  - 3. Review requirements for including layouts on Shop Drawings and other submittals.
  - 4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

#### 1.5 SUBMITTALS

- A. Qualification Data: For land surveyor or Professional Engineer.
- B. Certified Surveys: Submit two copies signed by land surveyor or Professional Engineer. Provide electronic Portable Document Format (PDF) of certified surveys to the Architect.
- C. Certificates: Submit certificate signed by land surveyor or Professional Engineer, certifying that location and elevation of improvements comply with requirements.
- D. Cutting and Patching Plan: Submit plan describing procedures at least 10 working days prior to the time cutting and patching will be performed. Include the following information:
  - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
  - 2. Identify how plan will comply with indoor air quality requirements and sound and vibration control for occupants in existing and nearby buildings.
  - 3. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
  - 4. Products: List products to be used for patching and firms or entities that will perform patching work.

5. Dates: Indicate when cutting and patching will be performed.
6. Existing Utilities Services and Plumbing, Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
  - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Final Property Survey: Submit 2 copies showing the Work performed and record survey data. Provide a PDF file to the Architect of final property survey.

#### 1.7 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Professional Engineer Qualifications: Refer to Section 01 40 00 "Quality Requirements."
- C. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect immediately of locations and details of cutting and await directions from Architect before proceeding.
    - a. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
  2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
  3. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, unsatisfactorily reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Existing Conditions: The existence and location of utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of utilities and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service, water-service, electrical service, and any other utilities.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Examine roughing-in for utilities and systems to verify actual locations of connections before equipment and fixture installation.
  - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 3. Verify compatibility with and suitability of surfaces and substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
  - 1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
  - 2. List of detrimental conditions, including substrates.
  - 3. List of unacceptable installation tolerances.
  - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces, substrates and conditions.



### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utilities located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each component. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements prior to fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically in Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately upon discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 01 31 00 "Project Management and Coordination."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.
- B. Engage a land surveyor or professional engineer experienced in laying out the Work, using the following accepted surveying practices:
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish limits on use of Project site.
  - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 4. Inform installers of lines and levels to which they must comply.
  - 5. Check the location, level and plumb, of every major element as the Work progresses.
  - 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

### 3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.

- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
  - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: When required by Owner or authorities having jurisdiction, upon completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: When required by Owner, engage a land surveyor or professional engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
  - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
  - 2. Recording: When required by Owner, at Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### 3.5 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb, and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
  - 4. Maintain minimum headroom clearance of 8 feet in occupied spaces and 7 feet 6 inches in unoccupied spaces, unless otherwise indicated in Drawings.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

- D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

### 3.6 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 in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of Work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Existing Utility Services and Mechanical/ Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/ systems prior to cutting to prevent interruption to occupied areas.
- F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or

adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  6. Proceed with patching after construction operations requiring cutting are complete.
- G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
  4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.
- 3.7 COORDINATION OF OWNER'S PORTION OF THE WORK
- A. Site Access: Provide access to Project site for Owner's construction personnel and Owner's separate contractors.
1. Provide temporary facilities required for Owner-furnished, Contractor-installed products.

2. Refer to Section 01 10 00 "Summary" for other requirements for Owner-furnished, Contractor-installed and Owner-furnished, Owner-installed products.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel and Owner's separate contractors.
  1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
  2. Preinstallation Conferences: Include Owner's construction personnel and Owner's separate contractors at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

### 3.8 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
  1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
  3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
    - a. Use containers intended for holding waste materials of type to be stored.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
  1. Remove liquid spills promptly.
  2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 50 00 "Temporary Facilities and Controls." and Section 01 74 19 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.9 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

### 3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

### 3.11 CORRECTION OF THE WORK

- A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Restore permanent facilities used during construction to their specified condition.
- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

## SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
  - 1. Salvaging nonhazardous demolition and construction waste.
  - 2. Recycling nonhazardous demolition and construction waste.
  - 3. Disposing of nonhazardous demolition and construction waste.

#### 1.3 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

#### 1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

#### 1.5 SUBMITTALS

- A. Waste Management Plan: Submit plan within thirty (30) calendar days of date established for the Notice of Award.
- B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
  - 1. Material category.
  - 2. Generation point of waste.
  - 3. Total quantity of waste in tons.
  - 4. Quantity of waste salvaged, both estimated and actual in tons.
  - 5. Quantity of waste recycled, both estimated and actual in tons.
  - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.

7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
  - C. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
  - D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
  - E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
  - F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
  - G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
  - H. Qualification Data:
- 1.6 QUALITY ASSURANCE
- 1.7 WASTE MANAGEMENT PLAN
- A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
  - B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
  - C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
    1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work in compliance with Section 02 41 19 "Selective Demolition."
    2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
    3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
    4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
    5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
    6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.



- D. Cost/ Revenue Analysis: Indicate total cost of waste disposal as if there were no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
1. Total quantity of waste.
  2. Estimated cost of disposal (cost per unit). Include transportation and tipping fees and cost of collection containers and handling for each type of waste.
  3. Total cost of disposal (with no waste management).
  4. Revenue from salvaged materials.
  5. Revenue from recycled materials.
  6. Savings in transportation and tipping fees by donating materials.
  7. Savings in transportation and tipping fees that are avoided.
  8. Handling and transportation costs. Include cost of collection containers for each type of waste.
  9. Net additional cost or net savings from waste management plan.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total nonhazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:
1. Demolition Waste:
    - a. Asphalt paving.
    - b. Concrete.
    - c. Concrete reinforcing steel.
    - d. Brick.
    - e. Concrete masonry units.
    - f. Wood studs.
    - g. Wood joists.
    - h. Plywood and oriented strand board.
    - i. Wood paneling.
    - j. Wood trim.
    - k. Structural and miscellaneous steel.
    - l. Rough hardware.
    - m. Roofing.
    - n. Insulation.
    - o. Doors and frames.
    - p. Door hardware.
    - q. Windows.

- r. Glazing.
- s. Metal studs.
- t. Gypsum board.
- u. Acoustical tile and panels.
- v. Carpet.
- w. Carpet pad.
- x. Demountable partitions.
- y. Equipment.
- z. Cabinets.
- aa. Plumbing fixtures.
- bb. Piping.
- cc. Supports and hangers.
- dd. Valves.
- ee. Sprinklers.
- ff. Mechanical equipment.
- gg. Refrigerants.
- hh. Electrical conduit.
- ii. Copper wiring.
- jj. Lighting fixtures.
- kk. Lamps.
- ll. Ballasts.
- mm. Electrical devices.
- nn. Switchgear and panelboards.
- oo. Transformers.
- 2. Construction Waste:
  - a. Masonry and CMU.
  - b. Lumber.
  - c. Wood sheet materials.
  - d. Wood trim.
  - e. Metals.
  - f. Roofing.
  - g. Insulation.
  - h. Carpet and pad.
  - i. Gypsum board.
  - j. Piping.
  - k. Electrical conduit.
  - l. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph

above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

- 1) Paper.
- 2) Cardboard.
- 3) Boxes.
- 4) Plastic sheet and film.
- 5) Polystyrene packaging.
- 6) Wood crates.
- 7) Wood pallets.
- 8) Plastic pails.

m. Construction Office Waste: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following construction office waste materials:

- 1) Paper.
- 2) Aluminum cans.
- 3) Glass containers.

### PART 3 - EXECUTION

#### 3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
  1. Comply with operation, termination, and removal requirements in Section 01 50 00 "Temporary Facilities and Controls."
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
  1. Distribute waste management plan to everyone concerned within three days of submittal return.
  2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
  2. Comply with Section 01 50 00 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

#### 3.2 SALVAGING DEMOLITION WASTE

- A. Comply with requirements in Section 02 41 19 "Selective Demolition" for salvaging demolition waste.

- B. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
  - 3. Store items in a secure area until installation.
  - 4. Protect items from damage during transport and storage.
  - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- C. Salvaged Items for Sale: Not permitted on Project site.
- D. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
  - 3. Store items in a secure area until delivery to Owner.
  - 4. Transport items to Owner's storage area designated by Owner.
  - 5. Protect items from damage during transport and storage.
- E. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- F. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- G. Plumbing Fixtures: Separate by type and size.
- H. Lighting Fixtures: Separate lamps by type and protect from breakage.
- I. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

### 3.3 RECYCLING CONSTRUCTION AND DEMOLITION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.
  - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.

4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

### 3.4 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Grind asphalt to maximum 1-1/2-inch size.
- B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
  1. Pulverize concrete to maximum 1-1/2-inch size.
- D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
  1. Clean and stack undamaged, whole masonry units on wood pallets.
  2. Pulverize damaged masonry units to maximum 1-1/2-inch size.
- E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- F. Metals: Separate metals by type.
  1. Structural Steel: Stack members according to size, type of member, and length.
  2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- H. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- J. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.
- K. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
  1. Store clean, dry carpet and pad in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- L. Carpet Tile: Remove debris, trash, and adhesive.
  1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- M. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.
- N. Conduit: Reduce conduit to straight lengths and store by material and size.
- O. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

### 3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
  1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
  2. Polystyrene Packaging: Separate and bag materials.

3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
  4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
  - B. Wood Materials:
    1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
    2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
  - C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
    1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
  - D. Paint: Seal containers and store by type.
- 3.6 DISPOSAL OF WASTE
- A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
    1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
    2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - B. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner's property.
  - C. Burning: Do not burn waste materials.

END OF SECTION

## SECTION 01 77 00 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
  - 1. Substantial completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Final cleaning.
- B. Related Requirements:
  - 1. Section 01 29 00 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
  - 2. Section 01 78 23 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
  - 3. Section 01 79 00 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

#### 1.3 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest-control inspection.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

#### 1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and

- corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 working days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
  3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
    - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
  5. Submit testing, adjusting, and balancing records.
  6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 working days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
  2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  3. Complete startup and testing of systems and equipment.
  4. Perform preventive maintenance on equipment used prior to Substantial Completion.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 "Demonstration and Training."
  6. Advise Owner of changeover in utility services.
  7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Complete final cleaning requirements.
  10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 working days prior to date the Work will be completed and ready for final inspection



and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

#### 1.8 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
  1. Submit a final Application for Payment in accordance with Section 01 29 00 "Payment Procedures."
  2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  4. Submit pest-control final inspection report.
  5. Submit Final Completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 working days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
  1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.9 LIST OF INCOMPLETE ITEMS

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
  1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
  2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
  3. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Page number.
  4. Submit list of incomplete items in one of the following formats:
    - a. MS Excel Electronic File: Architect will return annotated file.

- b. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).

#### 1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 calendar days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
  - 1. Submit by uploading to web-based project software site.
- E. Warranties in Paper Form:
  - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
  - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- F. Provide additional copies of each warranty to include in Operation and Maintenance (O&M) Manuals.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

### PART 3 - EXECUTION

#### 3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.

- b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
  - c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
  - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
  - e. Remove snow and ice to provide safe access to building.
  - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
  - g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
  - h. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
  - i. Vacuum and mop concrete.
  - j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
  - k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
  - l. Remove labels that are not permanent.
  - m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
  - q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
  - r. Clean strainers.
  - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 01 50 00 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste-disposal requirements in Sections 01 50 00 "Temporary Facilities and Controls" and 01 74 19 "Construction Waste Management and Disposal."

### 3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations required by Section 01 73 00 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION

## SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory manuals.
  - 2. Emergency manuals.
  - 3. Systems and equipment operation manuals.
  - 4. Systems and equipment maintenance manuals.
  - 5. Product maintenance manuals.
- B. Related Requirements:
  - 1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

#### 1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
  - 1. Submit by uploading to web-based project software site. Enable reviewer comments on draft submittals.
  - 2. Submit copy on digital media acceptable to Architect.
- C. Draft Manual Submittal: Submit draft copy of each manual at least 30 calendar days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 10 working days before commencing demonstration and training. Architect will return copy with comments.
  - 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 10 working days of receipt of Architect's and prior to commencing demonstration and training.
- E. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

#### 1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
  - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
  - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
  - 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
  - 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
  - 4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
  - 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    - a. If oversize drawings are necessary, fold drawings to same size as text pages for use as foldouts.
    - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in

manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

- c. Provide photographs instead of drawings to demonstrate unusual installations.

#### 1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  - 1. Title page.
  - 2. Table of contents.
  - 3. Manual contents.
- B. Title Page: Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.
  - 3. Name and address of Owner.
  - 4. Date of submittal.
  - 5. Name and contact information for Contractor.
  - 6. Name and contact information for Construction Manager.
  - 7. Name and contact information for Architect.
  - 8. Name and contact information for Commissioning Authority.
  - 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  - 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
  - 1. For manuals provided in paper format, if operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

#### 1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: For complex projects, prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
  - 1. List of Systems and Subsystems: List systems alphabetically. Include references to

operation and maintenance manuals that contain information about each system.

2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

#### 1.8 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated. Include information that must be immediately available during emergency situations to protect life and property and to minimize disruptions to building occupants.
- B. Content: Organize manual into a separate section for each of the following:
  1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
  1. Fire.
  2. Flood.
  3. Gas leak.
  4. Water leak.
  5. Power failure.
  6. Water outage.
  7. System, subsystem, or equipment failure.
  8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. Emergency Procedures: Include the following, as applicable:
  1. Instructions on stopping.
  2. Shutdown instructions for each type of emergency.
  3. Operating instructions for conditions outside normal operating limits.
  4. Required sequences for electric or electronic systems.
  5. Special operating instructions and procedures.

#### 1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
  1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.



2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
  1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  2. Performance and design criteria if Contractor has delegated design responsibility.
  3. Operating standards.
  4. Operating procedures.
  5. Operating logs.
  6. Wiring diagrams.
  7. Control diagrams.
  8. Piped system diagrams.
  9. Precautions against improper use.
  10. License requirements including inspection and renewal dates.
- C. Descriptions: Include the following:
  1. Product name and model number. Use designations for products indicated on Contract Documents.
  2. Manufacturer's name.
  3. Equipment identification with serial number of each component.
  4. Equipment function.
  5. Operating characteristics.
  6. Limiting conditions.
  7. Performance curves.
  8. Engineering data and tests.
  9. Complete nomenclature and number of replacement parts.
- D. Operating Procedures: Include the following, as applicable:
  1. Startup procedures.
  2. Equipment or system break-in procedures.
  3. Routine and normal operating instructions.
  4. Regulation and control procedures.
  5. Instructions on stopping.
  6. Normal shutdown instructions.
  7. Seasonal and weekend operating instructions.
  8. Required sequences for electric or electronic systems.
  9. Special operating instructions and procedures.
- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed, and identify color coding where required for

identification.

#### 1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
  - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.
- C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
  - 1. For less complex projects that require few manuals, source information may be included on title page.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
  - 1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
    - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.
  - 2. Troubleshooting guide.
  - 3. Precautions against improper maintenance.
  - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 5. Aligning, adjusting, and checking instructions.
  - 6. Demonstration and training video recording, if available.

- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- H. Maintenance Service Contracts: Where service contracts are specified for systems, subsystems, or equipment, include copies of maintenance agreements with name, electronic mail (email) address and telephone number of service agent.
- I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.
- J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original project record documents as part of maintenance manuals.

#### 1.11 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
  - 1. For less complex projects that require few manuals, content information may be included on title page.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.

3. List of cleaning agents and methods of cleaning detrimental to product.
  4. Schedule for routine cleaning and maintenance.
  5. Repair instructions.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings.
  - 2. Record specifications.
  - 3. Record Product Data.
  - 4. Miscellaneous record submittals.
- B. Related Requirements:
  - 1. Section 01 73 00 "Execution" for final property survey.
  - 2. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
  - 3. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit copies of Record Drawings as follows:
    - a. Final Submittal:
      - 1) Submit three paper-copy set(s) of marked-up record prints.
      - 2) Submit PDF electronic files of scanned Record Prints and three set(s) of file prints.
      - 3) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files and three paper copies of Project's Specifications, including addenda and Contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories and three paper copies of each submittal.
  - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories and paper copies of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an acceptable drawing technique.
    - c. Record data as soon as possible after obtaining it.
    - d. Record and check the markup before enclosing concealed installations.
    - e. Cross-reference record prints to corresponding photographic documentation.
  2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
  3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as for the original Contract Drawings.
  2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
  3. Refer instances of uncertainty to Architect for resolution.

4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
  - a. See Section 01 31 00 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
  - b. Architect will provide data file layer information. Record markups in separate layers.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
  1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Format: Annotated PDF electronic file.
  3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
  4. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect.
    - e. Name of Contractor.

#### 1.5 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
  5. Note related Change Orders and Record Drawings where applicable.
- B. Format: Submit record specifications as annotated PDF electronic file and paper copy.

#### 1.6 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF electronic file and paper copy.
  1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

#### 1.7 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file and paper copy.
  1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

#### 1.8 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION



SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.
  - 2. Demonstration and training video recordings.

1.3 SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Qualification Data: For facilitator, instructor and videographer.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit within seven days of end of each training module.
  - 1. Identification: On each copy, provide an applied label with the following information:
    - a. Name of Project.
    - b. Name and address of videographer.
    - c. Name of Architect.
    - d. Name of Construction Manager.
    - e. Name of Contractor.
    - f. Date of video recording.
  - 2. Transcript: Prepared and bound in format matching Operation and Maintenance (O&M) Manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
    - a. Electronic Copy: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project

and date of video recording on each page.

3. Training Manual: At completion of training, submit complete Training Manual(s) for Owner's use prepared in same paper and electronic file formats required for Operation and Maintenance (O&M) Manuals specified in Section 01 78 23 "Operation and Maintenance Data."

#### 1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
  1. Inspect and discuss locations and other facilities required for instruction.
  2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  3. Review required content of instruction.
  4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

#### 1.6 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

#### 1.7 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
  1. Various individual Specification Sections include requirements for demonstration and training. Refer to applicable Sections and requirements for development of instruction program.

- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Systems and equipment operation manuals.
    - c. Systems and equipment maintenance manuals.
    - d. Product maintenance manuals.
    - e. Project Record Documents.
    - f. Identification systems.
    - g. Warranties and bonds.
    - h. Maintenance service agreements and similar continuing commitments.
  3. Emergencies: Include the following, as applicable:
    - a. Instructions on meaning of warnings, trouble indications, and error messages.
    - b. Instructions on stopping.
    - c. Shutdown instructions for each type of emergency.
    - d. Operating instructions for conditions outside of normal operating limits.
    - e. Sequences for electric or electronic systems.
    - f. Special operating instructions and procedures.
  4. Operations: Include the following, as applicable:
    - a. Startup procedures.
    - b. Equipment or system break-in procedures.
    - c. Routine and normal operating instructions.
    - d. Regulation and control procedures.
    - e. Control sequences.
    - f. Safety procedures.
    - g. Instructions on stopping.
    - h. Normal shutdown instructions.

- i. Operating procedures for emergencies.
    - j. Operating procedures for system, subsystem, or equipment failure.
    - k. Seasonal and weekend operating instructions.
    - l. Required sequences for electric or electronic systems.
    - m. Special operating instructions and procedures.
  - 5. Adjustments: Include the following:
    - a. Alignments.
    - b. Checking adjustments.
    - c. Noise and vibration adjustments.
    - d. Economy and efficiency adjustments.
  - 6. Troubleshooting: Include the following:
    - a. Diagnostic instructions.
    - b. Test and inspection procedures.
  - 7. Maintenance: Include the following:
    - a. Inspection procedures.
    - b. Types of cleaning agents to be used and methods of cleaning.
    - c. List of cleaning agents and methods of cleaning detrimental to product.
    - d. Procedures for routine cleaning.
    - e. Procedures for preventive maintenance.
    - f. Procedures for routine maintenance.
    - g. Instruction on use of special tools.
  - 8. Repairs: Include the following:
    - a. Diagnosis instructions.
    - b. Repair instructions.
    - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
    - d. Instructions for identifying parts and components.
    - e. Review of spare parts needed for operation and maintenance.
  - 9. Proficiency: Include the following as recommended by systems' manufacturers, where applicable:
    - a. Evaluation of level of proficiency of participants after instruction.
    - b. Percentage of participants passing evaluation test.
- 1.8 PREPARATION
- A. Training Manual: Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a Training Manual organized in coordination with requirements in Section 01 78 23 "Operation and Maintenance Data."
  - B. Set up instructional equipment at instruction location.

1.9 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  - 1. **Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.**
  - 2. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - 1. Schedule training with Owner with at least five working days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
  - 1. If Project circumstances make training for certain components unfeasible or undesirable, make arrangements for training at a remote location or via remote video conference.
  - 2. Coordinate with requirements for scheduling of operation and maintenance data and demonstration and training.
- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, written or demonstration performance-based test, as appropriate.
- F. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.10 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
  - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode with vibration reduction technology.
  - 1. Submit video recordings by uploading to web-based Project software site. Provide a copy on CD-ROM or DVD-ROM.
  - 2. File Hierarchy: Organize folder structure and file locations according to Project Manual table of contents. Provide complete screen-based menu.
  - 3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.
  - 4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes the following for each Contractor involved on the Project, arranged according to Project Manual table of contents:
    - a. Name of Contractor/Installer.

- b. Business address.
  - c. Business phone number.
  - d. Point of contact.
  - e. Email address.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
  - 1. Film training session(s) in segments not to exceed 15 minutes.
    - a. Produce segments to present a single significant piece of equipment per segment.
    - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.
- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
  - 1. Furnish additional portable lighting as required.
- E. Narration: Describe scenes on video recording by either audio narration by microphone while recording video or dubbing audio narration off-site after video recording is recorded, as appropriate. Include description of items being viewed.
- F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
- G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

## SECTION 02 41 19 - SELECTIVE DEMOLITION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Demolition and removal of selected portions of building or structure.
- 2. Salvage of existing items to be reused or recycled, including but not limited to:
  - a. Lighting fixtures and equipment at offices and meeting rooms.
  - b. Audio/ visual equipment in Learning Spaces.
  - c. Existing wood framing, to be reused in Project.
  - d. Additional items as directed by Owner's Project Manager and Architect.

#### 1.3 DEFINITIONS

- A. General: Application: The following requirements apply to those items indicated in the Drawings.
- B. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- C. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store for sale or reuse.
- D. Remove and Save for Reuse: Same as "Remove and Salvage."
- E. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- F. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- G. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

#### 1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Unless otherwise indicated, salvaged and saved items are the property of Owner.
- C. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
  - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

#### 1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
  - 1. Inspect and discuss condition of construction to be selectively demolished, removed and salvaged items.

- a. Site-walk Review: Walk-through project with Architect to review all items for salvage and reuse.
  - b. Review whether additional survey of existing condition by structural engineer is required.
  - c. Review means and methods of demolition for items indicated to be salvaged or saved for reuse.
  - d. Review means and methods of demolition for items to be removed and adjacent to construction to remain visible.
2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
4. Review areas where existing construction is to remain and requires protection.
5. Document meeting with meeting minutes or other acceptable form, for review and distribution of all items to be salvaged and saved for reuse.

#### 1.6 SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician, where in scope of Work.
- B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of Selective Demolition Activities: After predemolition conference, indicate the following:
  1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted, where applicable.
    - a. Include list of items for salvage.
    - b. Indicate any special removal requirements or methods.
  2. Interruption of utility services. Indicate how long utility services will be interrupted.
  3. Coordination for shutoff, capping, and continuation of utility services.
  4. Use of stairs.
  5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- D. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces that might be misconstrued as damage caused by demolition operations. Comply with Owner's requirements. Submit before Work begins.
- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a final list of items that have been removed and salvaged.

#### 1.8 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.



1.9 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
  - 1. Before selective demolition, Contractor will verify adequacy of structure and shoring.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. Hazardous materials will be removed by Owner before start of the Work.
  - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is permitted where reviewed with Contractor, Owner and Architect for location and procedures prior to commencement of demolition Work.
  - 1. Provide adequate storage areas for salvaged heavy timber and other wood items, including sufficient area required for sorting and grading activities.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.
- G. Shoring: Prior to commencement of demolition Work, verify all required shoring is in place for structural removal and modification.

1.10 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.
- B. Coordinate storage layout areas with demolition and new construction schedules as to not interfere with Owner's and Contractor's operations.
- C. Coordinate area required for heavy timber sorting and grading with wood grader.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.
- C. Recycle and/ or salvage non-hazardous construction and demolition debris. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be divided from disposal and whether the materials will be sorted on-site or comingled. Excavated soil and land-clearing debris do not contribute to this credit. Calculations may be done by weight or volume, but shall be consistent throughout. The minimum percentage of debris to be recycled or salvaged for each point threshold are 50 percent for 1 point and 75 percent for 2 points.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
  - 1. Review required scope of surveying in predemolition conference.
  - 2. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
  - 3. Perform surveys where removal of structure has not been completed.
- D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
  - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
  - 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

#### 3.2 PREPARATION

- A. Refrigerant: Where in scope of Work, before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

#### 3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
  - 1. Arrange to shut off utilities with utility companies.
  - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
  - 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
    - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.

- d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
- e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
- g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

### 3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  - 2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  - 3. Cover and protect equipment that have not been removed.
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
  - 1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

### 3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
  - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  - 4. Cut items complying with Section 01 73 29 "Cutting and Patching."
  - 5. Do not use methods for removing wood construction that damages surfaces or edges.
  - 6. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
  - 7. Maintain fire watch during and for at least four (4) hours after flame-cutting operations.
  - 8. Maintain adequate ventilation when using cutting torches.

9. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  10. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  11. Dispose of demolished items and materials promptly.
  - B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - C. Removed and Salvaged Items: Verify during preconstruction meeting.
    1. Clean salvaged items.
      - a. Clean items for sale and/or reuse to functional condition adequate for reuse.
    2. Pack or crate items after cleaning. Identify contents of containers.
      - a. Pack or crate items after cleaning and repair, and identify contents of containers for items for sale.
    3. Store items in a secure area until delivery to Owner.
    4. Metal components, and crane rail and equipment storage: Store in dry locations, off the ground.
    5. Transport items to Owner's storage area designated by Owner.
    6. Protect items from damage during transport and storage.
  - D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- 3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS
- A. Concrete: Demolish in small sections, and one of the following:
    1. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
    2. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
  - B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
  - C. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- 3.7 DISPOSAL OF DEMOLISHED MATERIALS
- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction and recycle or dispose of them.
    1. Do not allow demolished materials to accumulate on-site.
    2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

- B. Burning: Do not burn demolished materials.

### 3.8 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations.

### 3.9 SELECTIVE DEMOLITION SCHEDULE

- A. All items listed below shall be reviewed, prior to commencement of demolition Work, during the predemolition conference.
- B. Remove: As indicated.
- C. Remove and Salvage/ Save for Reuse: As indicated.
- D. Existing to Remain: As indicated, or otherwise not indicated for removal.

END OF SECTION

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Southwestern Oregon Community College  
Attn: Emerald Brunett  
1988 Newmark Ave.  
Coos Bay, OR 97420

March 9, 2021

Re: AE 20101091 SWOCC Coaledo & Sumner Halls Phase II, 1988 Newmark Ave, Coos Bay, OR 97420.

You contracted Arcadia Environmental for the asbestos and lead inspection of Sumner Hall and Coaledo Hall at Southwestern Oregon Community College located at 1988 Newmark Ave, Coos Bay, OR 97420. The inspection was conducted on 3 March 2021 by Ken Newman, an AHERA certified asbestos building inspector. This inspection was performed in preparation for renovations of the buildings.

There are 2 buildings in this inspection, Sumner Hall and Coaledo Hall, both buildings are of similar construction, they are tip up concrete structures with concrete slab floors/foundations wood and concrete structural materials and currently they both have a PVC roofing system. The walls are sheet rock and wood, the ceilings have mixed drop ceilings in metal grid and ceiling tile fastened to sheetrock with mastic. The floors are concrete with tile, carpet and brick. The windows are aluminum with no putty. The plumbing is located in the walls, floors (drainage) and attics of both buildings. The TSI pipe insulation is fiberglass as is the ceiling insulation.

The survey was conducted according to EPA regulations in CFR 763. Subpart E and OSHA standards 29 CFR 1910 and 29 CFR 1926. No walls, ceilings or floors were penetrated to assess areas not visible during a normal inspection. No inaccessible areas were breached during this inspection unless otherwise noted. The inspection follows the AHERA guidelines for material description only, samples taken are based on the inspector's experience, OSHA guidelines and general protocols. The ACM (asbestos containing materials) classifications are SM (surfacing materials) TSI (thermal systems insulation) and MBM (miscellaneous building materials), their conditions will be described and they will be characterized as Friable or Non-friable, any volumes will be estimates only and not recommended for bidding purposes. All samples were sent to a NVLAP (national voluntary laboratory accreditation program) Laboratory for analysis. Bulk samples were analyzed by method PLM EPA 600/R-93/116.

## Sumner Hall

11 Asbestos samples were taken from the building during the inspection from the interior for analysis.

<b>Sample #</b>	<b>Description</b>	<b>Condition</b>	<b>ACM %</b>	<b>Friable/NON</b>
CT 1	Ceiling Tile (outside Room 12) - White Ceiling Tile	Good	Non-detect	N/A
WFT 2	Floor Tile (outside Room 12) - White Tile - Black Mastic	Good Good	Non-detect Non-detect	N/A N/A
BFT 3	Floor Tile (Electrical Room) - Brown Tile - Black Mastic	Good Good	2% Chrysotile 2% Chrysotile	Friable Non-friable
SRW 4	Sheetrock Wall (Electrical Room) - White Sheetrock - White Plaster	Good Good	Non-detect Non-detect	N/A N/A
SRW 5	Sheetrock Wall (hallway) - White Sheetrock - White Plaster	Good Good	Non-detect Non-detect	N/A N/A
FTM 6	Floor Tile w/Mastic (Nursing Lab) - White Floor Tile - Black Mastic	Good Good	Non-detect 2% Chrysotile	N/A Non-friable
FTM 7	Floor Tile w/Mastic - White Floor Tile - Yellow Mastic	Good Good	Non-detect Non-detect	N/A N/A
SRW 8	Sheetrock Wall (Nursing Lab) - White Sheetrock - White Plaster	Good Good	Non-detect Non-detect	N/A N/A
TBM 9	Toeboard Mastic (Nursing Lab) - Yellow Mastic	Good	Non-detect	N/A
FTM 10	Floor Tile w/Mastic (Room 11) - White Floor Tile - Various Mastic	Good Good	Non-detect Non-detect	N/A N/A
SRW 11	Sheetrock Wall (Room 11) - White Sheetrock - White Joint Compound	Good Good	Non-detect Non-detect	N/A N/A



### Coaledo Hall

9 Asbestos samples were taken from the building during the inspection from the interior for analysis.

Sample #	Description	Condition	ACM %	Friable/NON
CTM 12	Ceiling Tile w/Mastic (Room 10)			
	- White Ceiling Tile	Good	Non-detect	N/A
	- Brown Mastic	Good	Non-detect	N/A
FTM 13	Floor Tile w/Mastic (Room 10)			
	- White Floor Tile	Good	Non-detect	N/A
	- Yellow Mastic	Good	Non-detect	N/A
TBM 14	Toeboard Mastic (Room 10)			
	- Cream	Good	Non-detect	N/A
SRW 15	Sheetrock Wall (Room 10)			
	- White Sheetrock	Good	Non-detect	N/A
FTM 16	Floor Tile w/Mastic (Area 5)			
	- Off-white Floor Tile	Good	3% Chrysotile	Friable
	- Black Mastic	Good	5% Chrysotile	Non-friable
TBM 17	Toeboard w/Mastic			
	- Black Toeboard	Good	Non-detect	N/A
	- Brown Mastic	Good	Non-detect	N/A
SRW 18	Sheetrock Wall (Area 5)			
	- White Sheetrock	Good	Non-detect	N/A
CTM 19	Ceiling Tile w/Mastic			
	- White Ceiling Tile	Good	Non-detect	N/A
	- Cream Mastic	Good	Non-detect	N/A
TP 20	Transite Panel			
	- Grey	Good	20% Chrysotile	Non-friable

\*\* All sheet rock samples taken full depth to wood in areas expected to have joint compound.

Black = non-asbestos Red = contains ODEQ regulated asbestos levels green indicates trace or less than 1% asbestos

## Coaledo Hall Lead Paint

2 Lead samples were taken from the building during the inspection from the exterior for analysis.

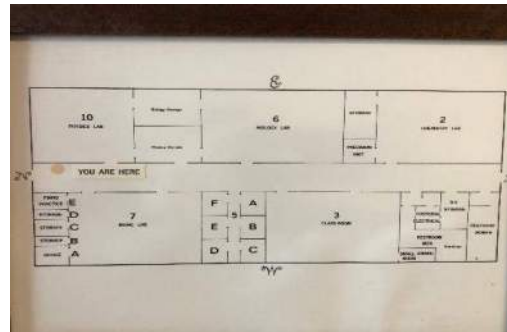
<u>Samples #</u>	<u>Location</u>	<u>% By weight</u>	<u>Lead</u>
GP 51	Grey Paint - Exterior Flashing	<0.009 %	NO
BP 52	Blue Paint - Exterior Trim	<0.009 %	NO

### **Lead Exposure Limits Paint**

0.5% by weigh is the HUD definition of lead-based paint  
1.0 mg/cm<sup>2</sup>  
5000 ppm

## Site Photos

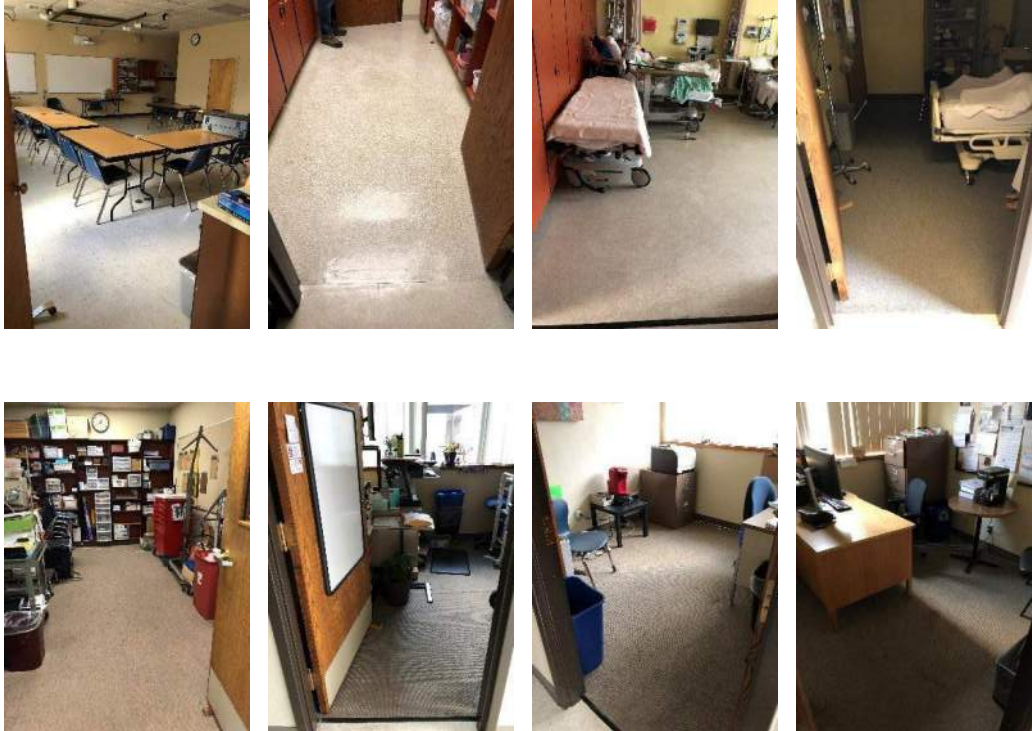












The buildings are an older structure with limited upgrades over the years and very limited suspect asbestos containing materials, there were only a few positive asbestos containing products in the flooring materials in the buildings, they are the original 9x9 VAT and the Cement Asbestos Board on the North side of Coaledo Hall in place of the windows. The pipe insulation in the attics is fiberglass and there is fiberglass insulation in the ceilings as well. The original 9x9 floor tiles are Asbestos with the black mastic. the walls and some ceilings are sheet rock with a limited amount texture, (SanAir laboratory does not separately identify paint as a texture nor the paper on the outside of the panels). There are black counters and tables throughout the school that are generally suspect for asbestos, all of the counters inspected are particle board with Formica surfacing material. The As with all construction and remodeling projects for buildings of this age there may be Thermal Systems Insulation and other Suspected Asbestos Containing Materials found in the walls, attics, crawl spaces and voids, if any suspect items are found all work must stop and a certified Asbestos inspector contacted for identification and disposition of the materials in question.

If there are any questions or concerns, please contact our office for clarification.



Inspector: Ken Newman, AHERA/ASHERA Inspector # IMR 19-4997B  
Arcadia Environmental Inc. OR CCB LBPR 211305  
PO Box 1290 Coos Bay OR 97420  
541-808-3880/541-260-4790

Laboratory: SanAir Technologies Laboratory  
1551 Oakbridge Drive, Suite B  
Powhatan, VA 23139  
804-897-1177

Structure: 1988 Newmark Ave.  
Coos Bay, OR 97420

Customer: Southwestern Oregon Community College  
Attn: Emerald Brunett  
1988 Newmark Ave.  
Coos Bay, OR 97420  
541-888-7229

Dates: Inspection, 2 March 2021  
Report, 9 March 2021

Respectfully,



Ken Newman  
AHERA/ASHERA Inspector  
Arcadia Environmental Inc

THIS IS TO CERTIFY THAT

**KEN NEWMAN**

HAS SUCCESSFULLY COMPLETED THE TRAINING COURSE

for

**ASBESTOS INSPECTOR / MANAGEMENT  
PLANNER REFRESHER**

In accordance with TSCA Title II, Part 763, Subpart E, Appendix C of 40 CFR

Course Date: 03/19/2020

Course Location: Portland, OR


Certificate: IMR-20-4997B



AHERA is the Asbestos Hazard  
Emergency Response Act enacting Title II  
of Toxic Substance Control Act (TSCA)

Expiration Date: 03/19/2021

For verification of the authenticity of this  
certificate contact:  
PBS Environmental  
4412 SW Corbett Avenue  
Portland, OR 97239  
(503) 248-1939

  
Andy Fridley, Instructor



SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

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. Cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, including the following types:
    - a. Troweled and sealed concrete slab (CONC-1).
  - 2. Below-slab vapor barrier (VB-1).

1.3 COORDINATION

- A. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.
- B. Coordinate all items to be cast-in to concrete. Contractor shall review items prior to placement.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
  - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
  - 2. Building Life-cycle Impact Reduction. For each mix design submit:
    - a. Submit product-specific Environmental Product Declarations (EPDs) for each mix design proposed on the Project.
    - b. Alternatively, submit an Industry-Wide EPD including external verification in accordance with ISO 14025 in which the manufacturer (batch plant operator) is explicitly recognized as a participant by the program operator.
- C. Shop Drawings: Indicate proposed layout of construction joints and control joints required to construct the structure.
  - 1. Construction Joint Shop Drawings: Indicate proposed construction joint locations for all concrete joints to be reviewed by the Architect. Include in these shop drawings column block outs, conspicuously indicating the shape and directional orientation of the block out.

2. Slab Control Joint Shop Drawings: See Architectural Drawings for slab on grade control joint locations. Submit any proposed revisions to be reviewed by the Architect at least two weeks prior to concrete placement.
  3. Locations of construction joints and control joints are subject to approval of the Architect.
  - D. Samples: For color pigments, form liners, form ties, tie cones and tie hole plugs.
  - E. Samples for Verification: For landscape concrete (CONC-3) provide samples, approximately 18 by 18 in. by 2 in. thick, for finish and texture produced by form-liner and color produced by tinting. Include a three-sample set showing the range of color variations expected.
  - F. Qualification Data: For Installer, manufacturer, and testing agency.
    1. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and owners, and other information specified.
  - G. Material Certificates: For each of the following, signed by manufacturers:
    1. Cementitious materials.
    2. Admixtures.
    3. Form materials and form-release agents.
    4. Steel reinforcement and accessories.
    5. Curing compounds.
    6. Bonding agents.
    7. Repair materials.
  - H. Additives Certificates: Copies of certificates prepared by the concrete supplier stating that the approved additives were added to each batch of concrete delivered to the site. Certificates shall also state, if applicable, amount of water which was withheld at the batch plant for inclusion at the site. Each certificate accompanied by one copy of each batch delivery ticket indicating the trade name, manufacturer's name, and amount per cubic yard of material added.
  - I. Material Test Reports: For the following, from a qualified testing agency:
    1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
  - J. Field quality-control reports.
- 1.6 QUALITY ASSURANCE
- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
  - B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94 requirements for production facilities and equipment.
    1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
  - C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E 329 for testing indicated.
    1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
  - D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
  - E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
    1. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
    2. ACI 315 "Details and Detailing of Concrete Reinforcement".
    3. ACI 318 "Building Code Requirements for Reinforced Concrete".
  - F. Stand-Alone Mockup, CONC-3: Landscape concrete wall to demonstrate form liner appearance and integral color, to receive acid-etched finish and demonstrate standard of workmanship.
    1. Build panel approximately 50 sq. ft. min. for formed surface in the location indicated or, if not indicated, as directed by Architect.
    2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Contracting Officer in writing.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.
  - B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  1. ACI 301.
  2. ACI 117.
  3. ACI 303R, for architectural concrete finishes.

### 2.2 FORM-FACING MATERIALS

- A. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
  1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
  2. Form release agent for form liners shall be acceptable to form liner manufacturer.

## 2.3 VAPOR BARRIER

- A. Sheet Vapor Barrier: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
  - 1. Basis-of-Design Product, VB-1: Stego Wrap 15 mil Class A by Stego Industries, LLC.; [www.stegoindustries.com](http://www.stegoindustries.com).
    - a. Vapor Permeance: 0.0098 Perms per ASTM E154.
  - 2. Other Approved Products: Provide one of the following, or other meeting the moisture vapor emission rate requirement of concrete moisture vapor reduction admixture.
    - a. Vapor Block VBLP15 by Raven Industries, Inc.; [www.ravenefd.com](http://www.ravenefd.com).
      - 1) Vapor Permeance: 0.0057 Perms per ASTM E96.
    - b. Perminator 15 mil by W. R. Meadows, Inc.; [www.wrmeadows.com](http://www.wrmeadows.com).
      - 1) Vapor Permeance: 0.0063 Perms per ASTM E96.
  - 3. Manufacturer's recommended tape and mastic for sealing at overlaps and openings.

## 2.4 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed. Refer to Structural Notes or structural drawings.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A1064, plain, fabricated from as-drawn steel wire into flat sheets.

## 2.5 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - 1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

## 2.6 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
  - 1. Portland Cement: ASTM C150, Type I/II.
  - 2. Fly Ash: ASTM C618, Class F or C. Refer to Structural Notes on drawings for allowed quantities.
  - 3. Silica Fume: ASTM C1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C33, coarse aggregate or better, graded. Provide aggregates from a single source.
  - 1. Maximum Coarse-Aggregate Size: 1-1/2 inches, 1 inch nominal.

2. Combined Aggregate Gradation: Well graded from coarsest to finest with not more than 18 percent and not less than 8 percent retained on an individual sieve, except that less than 8 percent may be retained on coarsest sieve and on No. 50 sieve, and less than 8 percent may be retained on sieves finer than No. 50.

D. Water: ASTM C94 and potable.

## 2.7 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C260.
- B. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  1. Water-Reducing Admixture: ASTM C494, Type A.
  2. Retarding Admixture: ASTM C494, Type B.
  3. Water-Reducing and Retarding Admixture: ASTM C494, Type D.
  4. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
  5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494, Type G.
  6. Plasticizing and Retarding Admixture: ASTM C1017, Type II.
- C. Color Pigment: ASTM C979, synthetic mineral-oxide pigments, color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
  1. Basis-of-Design Product: Chromix Admixtures for Color-Conditioned Concrete by Scofield, div. of Sika Corp.; <http://www.scofield.com>.
  2. Color: Manufacturer's standard color no. C-34 "Dark Gray".
- D. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C494, Type C.

## 2.8 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  1. Do not use calcium chloride.
  2. Use portland cement-lime, masonry cement or mortar cement mortar unless otherwise indicated.
  3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
  4. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Stone Masonry: Comply with ASTM C270.

- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
  - 1. Pigments shall not exceed 10 percent of portland cement by weight.
  - 2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
  - 3. Mix to match existing stone rubble wall.
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary.
  - 1. Color: Light grey range; as selected by Architect.

## 2.9 CURING MATERIALS

- A. General: For all topical treatments, confirm compatibility with finish floor manufacturer's requirements.
- B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
  - a. Bon Tool Co.
  - b. Vexcon Chemicals Inc.
- C. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- D. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- E. Water: Potable.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.

## 2.10 REPAIR MATERIALS

- A. Repair Overlayment and Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
  - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
  - 4. Compressive Strength: Not less than 5,000 psi at 28 days when tested according to ASTM C109.

## 2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  - 1. Fly Ash: 25 percent.

2. Combined Fly Ash or Pozzolan and Slag Cement: 20 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
3. Silica Fume: 10 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Synthetic Fiber: uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd.
- E. Admixtures: Use admixtures according to manufacturer's written instructions.
  1. Use high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
  2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
  4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

## 2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

## 2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94 and ASTM C1116, and furnish batch ticket information.
  1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

# PART 3 - EXECUTION

## 3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
  1. Prior to formwork erection, confirm Architect's review and approval of concrete mockup for finished-appearance concrete surfaces.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
  1. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
- F. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

- G. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- H. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- I. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
- J. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and attach securely to prevent deflection and maintain stability of liners during concreting. Prevent form liners from sagging and stretching in hot weather. Seal joints of form liners and form-liner accessories to prevent mortar leaks. Coat form liner with form-release agent.

### 3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

### 3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
  - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

### 3.4 WATERSTOPS INSTALLATION

- A. Provided by Section 07 13 26 "Sheet Membrane Waterproofing" for installation by this Section; coordinate with requirements for that Section to install waterstops with formwork and reinforcing.

### 3.5 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
  - 1. Do not cut or puncture vapor and radon barrier. Repair damage and reseal vapor and radon barrier before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.



- E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

### 3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
  - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
  - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

### 3.7 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
  - 1. Apply scratch finish to surfaces to receive concrete floor toppings.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
  - 1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing.
- D. Trowel Finish, CONC-1: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  - 1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
  - 2. Finish surfaces to the following tolerances, according to ASTM E1155, for a randomly trafficked floor surface:
    - a. At Formed Suspended Slabs: Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15.
  - 3. The concrete thicknesses indicated are minimums; Contractor shall anticipate additional concrete at center of structural bays where framing will deflect with placement.

4. For sealer at locations indicated CONC-1 refer to Section 07 19 00 "Water Repellents".
- E. Trowel and Fine-Broom Finish, CONC-2: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
  1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

### 3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
    - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
  3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
    - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
  4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial

application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.9 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
  - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  - 2. After concrete has cured at least 14 days, correct high areas by grinding.
  - 3. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  - 4. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- D. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- E. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- B. Inspections: As indicated in the General Structural Notes.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:
  - 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  - 2. Slump: ASTM C143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C231, pressure method, for normal-weight concrete; ASTM C173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C567/C567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C31.
  - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
  - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C39/C39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
  - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
  - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION

## SECTION 03 54 13 - GYPSUM CEMENT UNDERLAYMENT

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Nonstructural, self-leveling, gypsum cement underlayment for application below interior floor coverings.
  - 2. Acoustical/ sound mat.
- B. Related Requirements:
  - 1. Section 06 16 00 "Sheathing" for subfloor coordination.
  - 2. Section 07 92 00 "Joint Sealants".
  - 3. Section 09 29 00 "Gypsum Board" for coordination of installation at wall base at floors to receive gypsum underlayment.
  - 4. Section 09 68 00 "Carpeting" for substrate preparation requirements.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project Site.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.
  - 1. Include perimeter section details showing termination and expansion provisions.
  - 2. Include locations requiring blocking for other work, pour stops and transitions.
- C. Acoustical Data: Sound assembly testing indicating compliance with indicated requirements. Refer to Drawings for assembly requirements.
- D. Qualification Data: For Installer.
- E. Test Reports:
  - 1. For fire-resistant ratings, from a qualified testing agency.
  - 2. For STC-rated assemblies, from a qualified testing agency.
  - 3. For IIC-rated assemblies, from a qualified testing agency.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.
  - 1. Place gypsum cement underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Compressive Strength: Not less than 2500 psi tested in accordance with ASTM C472.
- B. Fire-Resistance Ratings: Comply with ASTM E119; 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.
- C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.
- D. IIC-Rated Assemblies: For IIC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E492 and classified according to ASTM E989 by an independent testing agency.

2.2 MANUFACTURERS

- A. Source Limitations for Gypsum Cement Underlayment: Obtain gypsum cement underlayment materials, primers, and accessories from single source or materials approved by underlayment manufacturer.

2.3 GYPSUM CEMENT UNDERLAYMENTS

- A. Gypsum Cement Underlayment: Self-leveling, gypsum cement product that can be applied in minimum uniform thickness of 1/8 inch to match adjacent floor elevations.
  - 1. Basis-of-Design Product: Treadstone Elite by formulated materials LLC.; [www.formulatedmaterials.com](http://www.formulatedmaterials.com).
  - 2. Other Approved Manufacturers:
    - a. USG Corp.; [www.usg.com](http://www.usg.com).
    - b. Or approved substitution.
  - 3. Cement Binder: Gypsum or blended gypsum cement as defined by ASTM C219.
  - 4. Fiber-Reinforcement: Manufacturer's standard integral fiber-reinforcement as required for depth.
  - 5. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.
- B. Reinforcement: For underlayment applied to wood substrates, provide galvanized metal lath or other corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.
- C. Water: Potable and at a temperature of not more than 70 deg F.
- D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

- E. Corrosion-Resistant Coating: Recommended in writing by underlayment manufacturer for metal substrates.
- F. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to underlayment.
- G. Sand Aggregate: As recommended by manufacturer.
- H. Application: As indicated.

## 2.4 ACCESSORIES

- A. Acoustical Mat, Resilient Underlayment: As required to meet STC and ICC rating, manufactured by or approved for use by underlayment manufacturer.
  - 1. Basis-of-Design Product: Acousti-Mat 3/8 Premium by Maxxon, Inc.; [www.maxxon.com](http://www.maxxon.com).
  - 2. Thickness: 3/8 inch.
  - 3. STC: STC required to meet 65 STC target for total floor assembly.
- B. Perimeter Isolation Strips: Manufacturer's foam isolation strips for perimeter and penetrations.
- C. Repair Overlayment: Manufacturer's recommended patching compound to correct damaged and uneven surfaces.
- D. Application: As indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for conditions affecting performance of the Work.
- B. Proceed with application only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. General: Prepare and clean substrate according to manufacturer's written instructions.
  - 1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
  - 2. Fill substrate voids to prevent underlayment from leaking.
- B. Wood Substrates: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coatings that might impair underlayment bond and remove sanding dust.
  - 1. Install underlayment reinforcement recommended in writing by manufacturer.
- C. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- D. Sound Control Mat: Install sound control materials according to manufacturer's written instructions.
  - 1. Do not install mechanical fasteners that penetrate through the sound control materials.
- E. Install perimeter isolation strips at all walls where underlayment abuts at base, and around all penetrations. Comply with manufacturer's installation details.
- F. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.
- G. Sound Control Mat: Install sound control materials according to manufacturer's written instructions.

1. Do not install mechanical fasteners that penetrate through the sound control materials.

### 3.3 APPLICATION

- A. General: Mix and apply underlayment components according to manufacturer's written instructions.
  1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
  2. Coordinate application of components to provide optimum adhesion to substrate and between coats.
  3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
  4. Install as accordance with ASTM F2419.
  5. Install to depths indicated.
    - a. Coordinate thicknesses of underlayment at areas to receive tile for tile assemblies to be flush with adjacent floor finishes. Refer to Section 09 30 00 "Tiling".
- B. Apply underlayment to produce uniform, level surface.
  1. Apply a final layer without aggregate to product surface.
- C. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
- D. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
- E. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.
- F. Repair damaged surfaces with patching compound.
- G. Apply surface sealer at rate recommended by manufacturer. Coordinate requirements with floor covering installers.
- H. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer. Coordinate with Work of other Sections.

### 3.4 PROTECTION

- A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION



## SECTION 05 50 00 - METAL FABRICATIONS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Steel framing and supports for mechanical and electrical equipment.
  - 2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
  - 3. Slotted channel framing for re-configurable structures (Unistrut).
  - 4. Metal ladders.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

#### 1.5 SUBMITTALS

- A. Product Data: For the following:
  - 1. Paint products.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for all items specified in this Section, including but not limited to all items indicated in Summary Article above.
- C. Welding certificates.
- D. Research/ Evaluation Reports: For post-installed anchors, from ICC-ES.

#### 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

#### 1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Steel Plates, Shapes, and Bars: ASTM A36.
- D. Channels, Angles, and S-Shapes: ASTM A36 or ASTM A572, Grade 36.
- E. Plate and Bar: ASTM A36 or ASTM A572, Grade 50.
- F. Steel Tubing: ASTM A500, cold-formed steel tubing.
- G. Steel Pipe: ASTM A53, Standard Weight (Schedule 40) unless otherwise indicated.
- H. Slotted Channel Framing (Unistrut): Cold-formed metal box channels (struts) complying with MFMA-4.
  - 1. Size of Channels: 1-5/8 by 1-5/8 inches or other manufacturer standard sizes as indicated or as required per delegated design.
  - 2. Material Interior (Conditioned/ Controlled Humidity): Cold-rolled steel, ASTM A1008, structural steel, Grade 33; 0.0677-inch minimum thickness; hot-dip galvanized after fabrication.
  - 3. Basis-of-Design Product: Unistrut Metal Framing System by Unistrut USA, Div. of Atkore Intl.; [www.unistrut.us](http://www.unistrut.us).

### 2.2 FASTENERS

- A. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- B. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
  - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- C. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
  - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.
- E. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

## 2.3 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 09 91 00 "Painting".
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.
- D. Welding Electrodes: Comply with AWS requirements.

## 2.4 FABRICATION, GENERAL

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
  - 1. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
  - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- C. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- E. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Form exposed work with accurate angles and surfaces and straight edges.
- G. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- I. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- J. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- K. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

## 2.5 METAL LADDERS

- A. General:
  - 1. Comply with ANSI A14.3.

B. Steel Ladders:

1. Space siderails 18 inches apart unless otherwise indicated.
2. Siderails: Continuous, 1/2-by-2-1/2-inch steel flat bars, with eased edges.
3. Rungs: 3/4-inch- square steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
7. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 3/4 inch in least dimension.
8. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide framing and supports not specified in other Sections as needed to complete the Work.
1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
1. Fabricate units from slotted channel framing where indicated.
  2. Furnish inserts for units installed after concrete is placed.
- C. Prime miscellaneous framing and supports with zinc-rich primer.
- D. Lintels and Ledgers: Provide lintels and ledgers as indicated for stone rubble veneer masonry.

2.7 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.8 STEEL AND IRON FINISHES

- A. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  3. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- B. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  - 1. Color and Gloss: As selected by Architect.

### PART 3 - EXECUTION

#### 3.1 ERECTION

- A. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
  - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- C. Splice members only where indicated.
- D. Do not use thermal cutting during erection except as approved by Architect on a case-by-case basis. Finish thermally cut sections within smoothness limits in AWS D1.1.
- E. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

#### 3.2 FIELD CONNECTIONS

- A. Weld Connections: Comply with AWS D1.1 and AWS D1.8 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
  - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
  - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

#### 3.3 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.

- 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
  - D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
  - E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- 3.4 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS
- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
  - B. Anchor supports for ceiling hung toilet partitions operable partitions overhead doors and overhead grilles securely to, and rigidly brace from, building structure.
  - C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
    - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- 3.5 ADJUSTING AND CLEANING
- A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 00 "Painting."

END OF SECTION

## SECTION 06 10 00 - ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Framing with dimension lumber.
  - 2. Wood blocking and nailers.
  - 3. Wood furring and grounds.
  - 4. Plywood backing panels.
- B. Section shall serve as basis-of-design for supplier/ installer's work to provide Owner-Furnished, Owner-Installed (OFOI) ramps and other carpentry fabrications.

#### 1.3 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
  - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
  - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
  - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.
- C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- D. Evaluation Reports: For the following, from ICC-ES:
  - 1. Wood-preservative-treated wood.
  - 2. Fire-retardant-treated wood.

- 3. Engineered wood products.
- 4. Power-driven fasteners.
- 5. Post-installed anchors.
- E. Metal framing anchors.

#### 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

### PART 2 - PRODUCTS

#### 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: S-DRY unless otherwise indicated.

#### 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with ground.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
  - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- D. Application: Treat all rough carpentry unless otherwise indicated.

#### 2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant



progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
  2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
  3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
  4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat all rough carpentry unless otherwise indicated.

#### 2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following: Blocking, nailers, furring and grounds.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:
1. Western woods; WCLIB or WWPA.
- C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:
1. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

#### 2.5 BLOCKING AND BACKING

- A. Provide bidder-designed blocking and backing as necessary to support wall and ceiling mounted equipment, both contractor-furnished/contractor-installed (CFCI) and owner-furnished/contractor-installed (OFCI).
1. Provide marine grade plywood, blocking, nailers, furring and grounds at all wet locations.
- B. Applications: Including but not limited to: Plumbing fixtures, toilet partitions, video monitors, projection screens, wall cabinets, and toilet accessories and other wall mounted fixtures weighing more than 5 lbs.
- C. Contractor shall coordinate the required backing installation with equipment or fixture manufacturer's recommendations.

2.6 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.7 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.8 MISCELLANEOUS MATERIALS

- A. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Provide bidder designed backing or blocking as required to support all specified wall or ceiling mounted equipment (whether owner-furnished or contractor-furnished). Including, but not limited to, plumbing fixtures, toilet partitions, video monitors, projection screens, wall cabinets, display cases, marker chalk and tack boards, toilet accessories, medical equipment, food service equipment, etc. Contractor to coordinate the required backing installation with equipment manufacturer's backing recommendations.
- E. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- F. Comply with AWWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
  - 1. Use inorganic boron for items that are continuously protected from liquid water.
  - 2. Use copper naphthenate for items not continuously protected from liquid water.
- G. Where wood-preservative-treated lumber is installed adjacent to or in contact with galvanized metal, metal decking, metal framing, or zinc-coated metal, install continuous flexible flashing separator between wood and metal decking.
- H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
  - 2. ICC-ES evaluation report for fastener.

- I. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

### 3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

### 3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal-size furring horizontally and vertically at 24 inches o.c.

### 3.4 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal-size furring horizontally and vertically at 24 inches o.c.

### 3.5 DEFLECTION HEAD CONSTRUCTION

- A. Required at the top of all non-bearing wall partitions that occur under open-web type framing members and where required within drawings. Allow minimum 3/4-inch space between top plate of wall and bottom truss chord for deflection tolerance.

### 3.6 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

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## SECTION 06 16 00 - SHEATHING

### 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.
- B. The General Structural Notes shall be used in conjunction with this specification. The General Structural Notes shall supersede items in this specification when discrepancies exist.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Wall sheathing.
  - 2. Sheathing joint and penetration treatment.
- B. Related Requirements:
  - 1. Section 06 10 00 "Rough Carpentry" for plywood backing panels.
  - 2. Section 07 25 00 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
- B. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
  - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
  - 2. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5516.
  - 3. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- C. Evaluation Reports: For the following, from ICC-ES:
  - 1. Wood-preservative-treated plywood.
  - 2. Fire-retardant-treated plywood.

#### 1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

- A. Emissions: Products shall meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- C. Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat all plywood unless otherwise indicated.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
  - 1. Use treatment that does not promote corrosion of metal fasteners.
  - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
  - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.

- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: As indicated or required by Code.

## 2.5 WALL SHEATHING

- A. Exterior Plywood Wall Sheathing: DOC PS1, APA Rated Exposure 1, Structural 1 sheathing; FR treated within 48 inches of fire walls.
  - 1. Span Rating: Not less than 32/16.
  - 2. Nominal Thickness: Not less than 15/32 inch.
- B. Glass-Mat Gypsum Sheathing: ASTM C1177.
  - 1. Acceptable Products: Subject to compliance with requirements, provide one of the following:
    - a. DensGlass Sheathing by Georgia-Pacific Gypsum, LLC; [www.buildgp.com](http://www.buildgp.com).
    - b. Securock Glass-Mat Sheathing, Regular and Firecode X by USG Corp.; [www.usg.com](http://www.usg.com).
    - c. GlasRoc Sheathing by Certainteed; [www.certainteed.com](http://www.certainteed.com).
  - 2. Type and Thickness: Type X, 5/8 inch thick.
  - 3. Size: 48 by 96 inches for vertical installation.
  - 4. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
  - 5. Exposure: Warranted against delamination and deterioration for up to 12-month exposure.

## 2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

## 2.7 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
  - 1. Adhesives shall have a VOC content of 50 g/L or less.
  - 2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated within the drawings, where not indicated, at a minimum, comply with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

### 3.2 WOOD SHEATHING INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Wall, Parapet and Roof Sheathing:
    - a. Fasten panels to framing as indicated on Structural Drawings.
    - b. Space panel 1/8 inch apart at edges and ends.
  - 2. Floor Sheathing:
    - a. Fasten panels to framing as indicated on Structural Drawings.
    - b. Space panel 1/8 inch apart at edges and ends.
    - c. At seams other than tongue and groove joints, provide continuous blocking at all seams.

### 3.3 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
  - 1. Fasten gypsum sheathing to wood framing with screws.
  - 2. Fasten gypsum sheathing to cold-formed metal framing with screws.
  - 3. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
  - 4. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.



- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.
  - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
  - 2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
  - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch edges and ends of panels.
  - 2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
  - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
  - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

### 3.4 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Roof Sheathing and Subflooring:
    - a. Glue and nail to wood framing.
    - b. Screw to cold-formed metal framing.
    - c. Space panels 1/8 inch apart at edges and ends.
  - 2. Wall Sheathing:
    - a. Nail to wood framing.
    - b. Screw to cold-formed metal framing.
    - c. Space panels 1/8 inch apart at edges and ends.

### 3.5 CEMENTITIOUS BACKER UNIT INSTALLATION

- A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

END OF SECTION

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SECTION 06 20 13 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Exterior wood trim (WT-1).
  - 2. Shop-application of decorative stain.

1.3 REFERENCES

- A. West Coast Lumber Inspection Bureau (WCLIB) Standard Grading Rules No. 16 for West Coast Lumber.

1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
  - 1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
  - 2. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
  - 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
- B. Samples for Verification:
  - 1. For each species and cut of lumber and panel products, with half of exposed surface finished; 50 sq. in. for lumber and 8 by 10 inches for panels.
- C. Compliance Certificates:
  - 1. For lumber that is not marked with grade stamp.
  - 2. For preservative-treated wood that is not marked with treatment-quality mark.
  - 3. For fire-retardant-treated wood that is not marked with classification marking of testing and inspecting agency.
- D. Evaluation Reports: For the following, from ICC-ES:
  - 1. Wood-preservative-treated wood.
  - 2. Fire-retardant-treated wood.
  - 3. Cellular PVC trim.
  - 4. Foam plastic moldings.
- E. Sample Warranties: For manufacturer's warranties.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.6 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.
  - 1. For exterior ornamental wood columns, comply with manufacturer's written instructions and warranty requirements.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
  - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or blotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 EXTERIOR WOOD TRIM, WT-1

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated.
  - 1. Species: Douglas fir (*Pseudotsuga menziesii*).
  - 2. Profile: Tongue-and-groove (T&G).
  - 3. Size: 2 x 6 inches nominal, or as indicated.
  - 4. Face Surface: Sanded.
- B. Shop Priming: Fully dipped process following cutting, prior to site delivery.
- C. Finish: Painted, as selected by Architect.
- D. Sheen: As selected by Architect.
- E. Application: As Indicated on Drawings.

2.2 FASTENERS

- A. Exposed Fasteners: Exposed on surface of wood siding; Type 304 stainless steel; wing-tipped wafer head screws.
  - 1. Corrosion Resistance: 1000 hours of salt spray test per ASTM B117 with no visible sign of surface red rust.
  - 2. Length: Sufficient to penetrate a minimum of 1-1/4- inch into solid framing.
  - 3. Spacing: As determined from SBC Research Institute, Technical Evaluation Report TER No. 1009-01.
  - 4. Basis-of-Design Manufacturer: FastenMaster, div. of OMG, Inc.; [www.fastenmaster.com](http://www.fastenmaster.com).

2.3 FABRICATION

- A. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

2.4 FINISHES

- A. Apply one coat of stain to all surfaces of sanded wood components by shop-dipping.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Mill-wrap all bundles of natural wood and protect from dampness at all times. 12 percent moisture content maximum at time of installation.

3.2 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed. Cut to required lengths and prime ends. Comply with requirements in Section 09 91 00 "Painting".

3.4 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
  - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
  - 1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
  - 2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
  - 3. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.
  - 4. Face fasten boards with siding head screws. Locate fasteners above lap joints, do not fasten through laps. One fastener per board, through furring, insulation, and sheathing, into solid framing at each bearing point. Fasteners shall be positioned in neat, straight rows.
- C. Field Cuts: Make all field cuts on siding with fine tooth finishing saw. Restain cut ends and edges. Scarf cut all end splices and brush treat or prime all cut ends and edges with stain as used for mill treatment before installation of board.

3.5 ADJUSTING

- A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

- A. Clean exterior finish carpentry on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.7 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
  - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

## SECTION 06 20 23 - INTERIOR FINISH CARPENTRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes interior finish carpentry including but not limited to the following:
  - 1. Plywood Wall Paneling (PWP-1).
  - 2. Wood board veneer (WD-1 and WD-3)
  - 3. Solid wood lumber trim with clear finish (WD-2 and WD-4).
  - 4. Upholstery fabric (UPH-1 and UPH-2)
  - 5. Wood furring, blocking, shims, and hanging strips for installing interior finish carpentry unless concealed within other construction before installation.
  - 6. Shop finishing of interior finish carpentry and fabrications.
- B. Products Installed but not Furnished under this Section:
  - 1. Custom metal supports, shelving brackets, table bases and other supporting metal.

#### 1.3 COORDINATION

- A. Coordinate the following:
  - 1. Clearances for installation and operation, including plumbing and electrical connections, of appliances and equipment installed in casework.
  - 2. Fixtures, sinks and other plumbing work to be coordinated with cabinets.
  - 3. Electrical work to be coordinated with cabinets.
  - 4. Coordination of veneer and finishes with flush wood doors.
- B. Equipment Coordination: Distribute copies of approved fixtures scheduled in Division 22 "Plumbing" Sections and in Division 26 "Electrical" Sections to fabricator of interior finish carpentry; coordinate Shop Drawings and fabrication with clearance requirements and electrical and plumbing connections.
  - 1. Where dimensional conflicts occur, notify Architect or indicate on Shop Drawings.
- C. Deliver anchoring devices to be built into substrates, well in advance of time substrates are to be built.
- D. Coordinate required blocking in walls for attaching and support.
- E. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.
- F. Coordinate wood finishes with all wood-veneer applications in Project.
- G. Coordinate concealed steel support brackets with Section 05 50 00 "Metal Fabrications."

#### 1.1 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.2 DEFINITIONS

- A. MDF: Medium-density fiberboard.
- B. MDO: Plywood with a medium-density overlay on the face.

1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
  - 1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
  - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, attachment devices, and other components.
  - 1. Show connection details half-size.
  - 2. Apply WI Certified Compliance Program label to Shop Drawings.
  - 3. Indicate coordination of fabrications with electrical and plumbing work.
- C. Samples:
  - 1. Woodworking Products: For each species, cut, profile, and finish; demonstrate range of color and grain variation expected in Work. Two feet by board, or molding, width; One foot by panel width.
    - a. Solid Stock: Two samples of each, finish one side and one edge.
    - b. Plywood and Panels: Two samples of each finish.
    - c. Veneer: One sample from each flitch.
    - d. Plastic Laminate: One sample of each color, and surface type.
  - 2. Provide stepped finish on two samples (one face and one edge) with exposed prepared substrate, and each additional application of finishing materials for each finish system required.
    - a. Veneer: Provide veneer matching specified.
  - 3. Metal Fabrications: One sample of each color and finish indicated.
    - a. Metal-Faced Casework: Provide sample of sheet stock and demonstrate typical fabrication technique and appearance in formed sample of assemblies indicated. Include finished edges and corners.
  - 4. Upholstery Fabric: Provide sample as recommended by manufacturer's memo.
  - 5. Countertops: Two pieces of each type and thickness as required.
  - 6. Hardware: One sample of each type and finish required for approval of function and appearance.
- D. Qualification Data: For Installer/ Fabricator of each type required.
- E. Product Certificates: For each type of product.
- F. Material Certificates: For each type of product, including but not limited to the following:



1. For each type of flame-retardant treatment of fabric.
  2. Foam plastics; upholstery foam.
- G. Woodwork Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For cabinets, woodwork finishes, metal finishes hardware and upholstery to include in operation and maintenance manuals. Include the following:
1. Methods for maintaining upholstery fabric.
  2. Precautions for cleaning materials and methods that could be detrimental to finishes and performance for all exposed finishes.
  3. Methods for maintaining and adjusting hardware.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Upholstery Fabric: For each fabric, color, and pattern installed, furnish length equal to 10 percent of amount installed, but no fewer than 2 sq. yd., full width of bolt.

#### 1.6 QUALITY ASSURANCE

- A. Quality Standard: Unless otherwise indicated, comply with the Woodwork Institute's "Architectural Woodwork Standards" for grades of indicated for construction, finishes, installation, and other requirements.
1. Provide labels and certificates from AWI or WI certification program indicating that woodwork complies with requirements of grades specified.
  2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
1. Upholstery Fabricator: A minimum 5 years successful experience with work similar in scope and complexity to that required for the Project.
- C. Mockups: Build sample mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockups of typical paneling as shown on Drawings.
  2. Upholstered Seating: Provide the following, mounted to wood substrates indicated on Drawings:
    - a. Half-depth of seat, 24 inches long, with corner radius.
- D. Overage: Ensure appropriate amount of overage to account for quality requirement; for linear lumber profile assemblies to allow for approximately 25 percent additional materials to allow sorting and rejecting to meet quality requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- B. Deliver wood materials only when environmental conditions comply with requirements specified for installation areas. If materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.8 FIELD CONDITIONS

- A. Temperature and Humidity For Installation: As required by referenced quality standards, and fabricator to maintain moisture content of installed Work within 1.0 percent of optimum moisture content, maintain conditions until final acceptance.
- B. Do not install materials that are wet, moisture damaged, or mold damaged.
- C. Field Measurements: Taken prior to fabrication of woodwork to be fitted to other construction, verify dimensions on shop drawings.
  - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.9 SEQUENCE AND SCHEDULING

- A. Complete work in installation areas which could damage architectural woodwork, and establish controlled environmental conditions prior to delivery of materials.
- B. Conditioning Period: Store wood products for four days (96 hours) at Project prior to installation.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL FABRICATORS

- A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of architectural wood cabinets with sequence-matched wood paneling, wood doors with face veneers that are sequence matched with woodwork and transparent-finished wood doors that are required to be of same species as woodwork.

2.2 MANUFACTURERS

- A. Acceptable Veneer Manufacturers: Subject to compliance with requirements and review by Architect, the following may be incorporated into Work:
  - 1. Fabricator's preferred vendor.
  - 2. Cascadia Forest Goods, LLC; [www.cascadiaforestgoods.com](http://www.cascadiaforestgoods.com).
  - 3. The Collings Companies; [www.collinswood.com](http://www.collinswood.com).
  - 4. Or other approved veneer manufacturer.

2.3 MATERIALS, GENERAL

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
  - 1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
  - 2. Wood Moisture Content: 10 percent.

- B. Hardwood Lumber for Transparent Finishes: AWS Premium Grade requirements and appearance represented by approved samples; provide species and cut scheduled, unless indicated otherwise; selected for uniformity in grain and color, and free of character marks. Provide where indicated, and the following applications:
  - 1. Provide specified wood for opaque finishes where indicated to be painted.
- C. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated; formaldehyde free.
  - 1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 150, unless indicated otherwise:
    - a. Provide MR50 at areas where water resistance is required.
    - b. Edge sealed; profile indicated.
  - 2. Plywood Backing: Plywood, DOC PS 1, Exterior, A-C; ASTM 84 Class B.
    - a. Basis-of-Design Manufacturers:
      - 1) Murphy Company; [murphyplywood.com](http://murphyplywood.com).
      - 2) Columbia Forest Products; [www.columbiaforestproducts.com](http://www.columbiaforestproducts.com).
      - 3) Roseburg; [www.roseburg.com](http://www.roseburg.com).
    - b. Thickness: 1/2 inch, unless indicated otherwise.
  - 3. Faced Plywood, for Paneling:
    - a. Basis-of-Design Manufacturer: Soelberg Industries; [www.soelbergi.com](http://www.soelbergi.com).
    - b. Basis-of-Design Product: Rotto Natura Collection by Soelberg.
      - 1) Species: Baltic Birch.
      - 2) Finish: Clear.
      - 3) Application: Provide at Wall Paneling at Coaledo Hall; or as indicated in Drawings.
  - 4. Medium Density Overlay MDO Panels: 0.75 inch thick, minimum seven ply APA Group I B-B solid veneer layers free of splits and all other voids, with resin impregnated paper facings on both sides; free of add urea formaldehyde.

#### 2.4 WOOD BOARD VENEER, WD-1

- A. Species: White Oak (*Quercus alba*).
- B. Grade: As selected by Architect.
- C. Profile: Rift-Sawn.
- D. Finish: Clear
- E. Application: Provide at Sumner Hall as indicated in Drawings.

#### 2.5 WOOD BOARD VENEER, WD-3

- A. Species: Bigleaf Maple (*Acer macrophyllum*).
- B. Grade: As selected by Architect.
- C. Profile: Rift-Sawn.
- D. Finish: Clear
- E. Application: Provide at Coaledo Hall as indicated in Drawings.

2.6 SOLID STOCK WOOD LUMBER TRIM, WD-2

- A. Species: White Oak (*Quercus alba*).
- B. Profile: Rift-Sawn.
- C. Thickness: As indicated.
- D. Finish: Field-applied clear finish; refer to Finishes articles below.
- E. Application: Provide at Sumner Hall as indicated in Drawings.

2.7 SOLID STOCK WOOD LUMBER TRIM, WD-4

- A. Species: Bigleaf Maple (*Acer macrophyllum*).
- B. Profile: Rift-Sawn.
- C. Thickness: As indicated.
- D. Finish: Field-applied clear finish; refer to Finishes articles below.
- E. Application: Provide at Coaledo Hall as indicated in Drawings.

2.8 UPHOLSTERY FABRICS

- A. Provide upholstery fabric as indicated in Drawings.
- B. Built-In-Bench Seat Fabric, UPH-1:
  - 1. Basis-of-Design Product: Model no. 09108306 Canter EPU by Momentum Textiles & Wallcovering; [www.momentumtextilesandwalls.com](http://www.momentumtextilesandwalls.com).
    - a. Material: 100 percent EPU Polyurethane.
    - b. Color: "Night"
    - c. Width: 54 inches.
  - 2. Applications: Provide at Sumner Hall as indicated in Drawings.
- C. Built-In-Bench Back Fabric, UPH-2:
  - 1. Basis-of-Design Product: Utopia Part of Elemental Collection by Pallas; [www.pallastextiles.com](http://www.pallastextiles.com).
    - a. Material: 39 percent recycled solution dyed nylon, 36 percent rayon, 25 percent polyester.
    - b. Color: No. 27.278.094 "Denim"
    - c. Width: 54 inches.
    - d. Finish: Nanotex/ Acrylic.
  - 2. Applications: Provide at Sumner Hall as indicated in Drawings.

2.9 MISCELLANEOUS MATERIALS

- A. All other metals: Refer to Section 05 50 00 "Metal Fabrications".
- B. Fasteners: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
  - 1. Confirm compatible with substrate treatment and framing types without galvanic or corrosive reactions.

- D. Wall-Mounting Panel Clips: Provide extruded aluminum, two-part cleat mounting hardware, 6005A T5 aluminum; brackets designed to support full weight of panels and clips designed for lateral support, with one part mechanically attached to back of panel and the other attached to substrate.
- E. Low-Emitting Materials: Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
  - 1. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for use. Clear, non-staining or color-altering where exposed.
  - 2. Multipurpose Construction Adhesive: Formulation complying with ASTM D3498 that is recommended for indicated use by adhesive manufacturer.
  - 3. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
  - 4. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.
- F. Furring, Blocking, Shims, and Hanging Strips: Softwood lumber, kiln dried to less than 15 percent moisture content. Provide pressure treated wood where in contact with concrete.
- G. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
  - 1. Comply with applicable requirements of ASTM A307 for screws and ASTM F1667 for nails.
- H. Upholstery Accessories: Provide all required materials for complete installation indicated.

#### 2.10 FABRICATION

- A. Fabricate interior finish carpentry to dimensions, profiles, and details indicated with openings and mortises precut, where possible, to receive hardware and other items and work.
- B. Scribe wood base materials to finished floor surfaces, and jamb molding tight to adjacent wall surfaces.
- C. Ease edges to 0.0625 inch radius, for corners of cabinets and edges of solid wood (lumber) members less than 1 inch in nominal thickness, 0.125 inch radius for edges of rails and similar members over 1 inch in nominal thickness.
- D. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  - 1. Cabinet Shelves: Particle board or other acceptable panel product with thickness conforming to AWI Section 400-G-8, and provide shelf panel to limit deflection to 0.25 inch or less for a uniform load of 46 pounds per lineal foot. Spans greater than 42 inches are not acceptable.
  - 2. Dado Case for recessed installation of shelf standards where adjustable shelves are required inside cabinet.
- E. Pre-Cut Openings: To accommodate hardware, appliances, equipment, service connections and similar components. Locate and size openings accurately. Use templates or roughing-in diagrams for proper size and shape. Smooth edges of cutoffs and, where located in countertops and similar exposures seal edges of cutouts with a water-resistant coating.
  - 1. Provide grommets in configuration necessary to line and close countertop and case penetrations.

- F. Standing and Running Trim and Rails Standing and Running Trim and Rails: AWS Quality Standards Sections 6 and 7, Custom Grade.
- G. Wood Panels: Comply with AWS Section 6 and Section 8 requirements for Premium Grade fabrications of hardwood veneer faced composite panel with solid stock edges for vertical and horizontal applications. Provide concealed attachment using clips and mechanical fasteners. Provide hinged, removable panels for locations indicated secured by concealed catch or other acceptable device
  - 1. Fire Performance Characteristics: ASTM E84 flame spread 75 and smoke development 40 is required.
  - 2. CNC-Milling: Finished milled surfaces shall have smooth finish without blemishes, tool marks or surface irregularities.
- H. Custom Hardwood Seating: Solid stock slats, cross rails and perimeter frame fabricated from the specified hardwood in size and configuration indicated on A581 and as otherwise required. Comply with AWS Section 6 for Premium Grade work. Dado slats and join to cross rails and perimeter frame for flush surface profile indicated. Provide unitized rigid panel for seat and back for attachment and support by metal brackets as required.
- I. Upholstered Fabrications: Fabric faced foam, with stitching to match fabric materials.
  - 1. Comply with AWI Section 400, Premium Grade, as applicable to construction techniques, materials and joinery. Fabricate bench with exposed solid wood base and veneer face panels, unless, otherwise indicated, with clear finish.
  - 2. Frame as detailed on the drawings using Standard Grade lumber or plywood complying with the requirements of Section 06 10 00 "Rough Carpentry" and this Section. Provide 3/4 inch thick softwood plywood for concealed plywood; provide 3/4 inch thick hardwood plywood for exposed surfaces unless indicated otherwise.
  - 3. Upholstery: Fabricate fabric-covered cushions with molded padding beneath fabric and with fabric covering free of welts, creases, stretch lines, and wrinkles. For each upholstered component, install pile and pattern run in a consistent direction.
  - 4. Apply padding to wood substrates with not less than three Velcro strips running longitudinally continuously across length of pad to within 1 inch of each end or as indicated on Drawings.
  - 5. Upholster with a single piece of fabric to the greatest extent possible. Conceal all terminations out of normal view or under trim as shown on the drawings. Reinforce seams.

## 2.11 SHOP FINISHING

- A. General: Finish interior finish carpentry with finish indicated on Drawings at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior carpentry, as applicable to each unit of work.
  - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of interior finish carpentry. Apply two coats to end-grain surfaces.
- C. Transparent Finish: Hand-applied using manufacturer's recommended procedures; provide four-coat application on all exposed surfaces and buff to final appearance per approved samples. Provide two-coat finish on concealed surfaces, buffing is not required; Zero VOC content. Comply with AWS Section 5.
  - 1. Finish: AWI System 4 latex acrylic, waterbased, satin; match Architect's sample.

2.12 SHOP PRIMING

- A. Interior Finish Carpentry for Opaque Finish: Shop prime with one coat of wood primer as specified in Section 09 91 00 "Painting."
- B. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior carpentry, as applicable to each unit of work.
  - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of interior finish carpentry.

2.13 STEEL AND IRON FINISHES

- A. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
  - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 3. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- B. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  - 1. Color and Gloss: As selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installation, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION

- A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.
- B. Install woodwork plumb, level, true and straight with no distortions. Scribe and cut woodwork to fit adjoining work including variations in finish floors, and refinish cut surfaces or repair damaged finish at cuts. Coordinate woodwork with electrical and plumbing work.
  - 1. Shims: Concealed, provide as required.

2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
  - C. Secure Work to grounds, stripping, blocking, and inserts. Use concealed fasteners and blind nailing wherever possible. Countersink, fill flush and finish exposed fasteners to match adjacent surface, unless otherwise indicated.
    1. Coordinate with Work of Section 09 22 16 "Non-Structural Metal Framing" for location of backing plates and reinforcing in framed walls.
  - D. Interior Finish Carpentry: Comply with requirements, and AWI Section 6, matching grades indicated, and the following:
    1. Standing and Running Trim: Division A, Premium grade. Gaps behind members shall be filled and finished to match the backing surface.
      - a. Install wood base by back attaching or by direct adhering to base sheet material. Attachment through exposed faces is not allowed.
    2. Paneling: Division C, Premium grade. Provide one of the following:
      - a. Anchor paneling to supporting substrate with concealed panel-hanger clips.
      - b. Blind-nail to plywood backing.
      - c. Direct screw attach to plywood backing installed to wall or partition.
        - 1) Fill countersunk screw holes with non-shrink filler; sand flush for final finishing.
        - 2) Install joint sealant following manufacturer's written instruction at panel joints; finish joints flush for seamless finish.
    3. Wood Bench: Coordinate with Work of Section 06 10 00 "Rough Carpentry" ensure configuration of wood fabrications.
  - E. Field Joints: Acceptable only as shown on approved submittals. Install work with the minimum number of joints possible. Cope and miter joints; stagger joints in adjacent and related members. Comply with AWI quality standards referenced for shop fabrication.
  - F. Tolerances: 0.125 inch in 8 feet for plumb and level (including tops); and with no variations in flushness of adjoining surfaces, except where referenced standard is tighter.
- 3.4 ADJUSTMENT, CLEANING, FINISHING, AND PROTECTION
- A. Repair damaged and defective interior finish carpentry where possible to eliminate defects functionally and visually; where not possible to repair replace Work. Adjust joinery for uniform appearance.
  - B. Clean, lubricate and adjust hardware.
  - C. Clean interior finish carpentry on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.
  - D. Provide final protection and maintain conditions, in a manner acceptable to Fabricator and Installer, which ensures architectural interior finish carpentry being without damage or deterioration at time of substantial completion.

END OF SECTION



## SECTION 06 41 00 - ARCHITECTURAL CASEWORK

### 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. Plastic-laminate-clad architectural cabinets (PLAM-1, PLAM-2, PLAM-3, PLAM-4, PLAM-4, PLAM-5, and PLAM-6).
2. Solid-surface fabrications (SURF-1, SURF-2, SURF-3, and SURF-4).
3. Stainless steel countertop with integral sink and backsplash (SS-1).
4. Milwork reveal (MWR-1).
5. Hardware and accessories (HDWR-1, HDWR-2, HDWR-3, HDWR-4, HDWR-5, and HDWR-6).
6. Wood furring, blocking, shims, and hanging strips for installing architectural wood cabinets unless concealed within other construction before cabinet installation.

- B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
2. Division 22 "Plumbing" Sections for coordination of fixtures with cabinets.

#### 1.3 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.5 SUBMITTALS

- A. Product Data: For each type of product, including panel products, fire-retardant-treated materials, cabinet hardware and accessories, and finishing materials and processes.
  1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
  1. Show details full size.
  2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
  3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural wood cabinets.

4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
  5. For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
  - C. Samples for Initial Selection:
    1. Shop-applied transparent finishes.
    2. Shop-applied opaque finishes.
    3. Plastic laminates.
    4. Powder coated finishes.
    5. Painted and primed finishes.
  - D. Samples for Verification:
    1. Plastic Laminates: 3 by 5 inches, for each type, color, pattern, and surface finish.
    2. Exposed cabinet hardware and accessories, one unit for each type and finish.
    3. For the Following Countertop Products:
      - a. Countertop material, 4 inches square.
      - b. Wood trim, 8 inches long.
  - E. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.
- 1.6 QUALITY ASSURANCE
- A. Fabricator/ Installer Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance..
  - B. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
  - C. Overage: Ensure appropriate amount of overage to account for quality requirement; for all wood types allow for approximately 25 percent additional materials to allow sorting and rejecting to meet quality requirements.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.
- 1.8 FIELD CONDITIONS
- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
  - B. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 17 and 50 percent during the remainder of the construction period.
  - C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on

Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- D. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

## 1.9 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that wood-veneer-faced architectural cabinets can be supported and installed as indicated.
- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 08 71 00 "Door Hardware" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

## PART 2 - PRODUCTS

### 2.1 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
  2. Wood Moisture Content: 8 to 13 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130, unless indicated otherwise.
  2. Softwood Plywood: DOC PS 1, medium-density overlay.
  3. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.
  4. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

### 2.2 ARCHITECTURAL CABINET FABRICATORS

- A. Approved Local Fabricators:
1. Burgener's Woodworking, Inc.; [www.burgenerswoodworking.com](http://www.burgenerswoodworking.com).
  2. Faustrollean Fixture Co.; [www.faustro.com](http://www.faustro.com).
  3. Mark Newman Design in Wood; [www.marknewman.com](http://www.marknewman.com).
- B. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of architectural wood cabinets with sequence-matched wood paneling, wood doors with face veneers that are sequence matched with woodwork and transparent-finished wood doors that are required to be of same species as woodwork.

2.3 ARCHITECTURAL CABINETS, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Institute (AWI) "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.
  - 1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

2.4 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS, PLAM-1, PLAM-2, PLAM-3, AND PLAM-4

- A. Architectural Woodwork Standards Grade: Cabinets shall be built in conformance to Custom Grade, unless specified otherwise.
- B. Type of Construction: Frameless.
- C. Door and Drawer-Front Style: Flush overlay.
  - 1. Reveal Dimension: As indicated on Drawings.
- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
  - 1. Pattern Direction: Vertically for doors and fixed panels, horizontally for drawer fronts.
- E. Laminate Cladding for Exposed Surfaces:
  - 1. Vertical Surfaces: Grade VGS.
    - a. Basis-of-Design Product, PLAM-1, PLAM-2, and PLAM-4: High Pressure Laminate by Wilsonart LLC; [www.wilsonart.com](http://www.wilsonart.com).
      - 1) Colors:
        - a) PLAM-1: No. 7990 "Mission Maple".
        - b) PLAM-2: No. D427 "Linen".
        - c) PLAM-4: No. 7938 "New Age Oak".
      - 2) Finishes:
        - a) PLAM-1: "Matte".
        - b) PLAM-2: "Matte".
        - c) PLAM-4: "Matte".
    - b. Applications:
      - 1) PLAM-1: Base cabinets at Sumner Hall; or as indicated in Drawings.
      - 2) PLAM-2: Upper Cabinets at Sumner Hall; or as indicated in Drawings.
      - 3) PLAM-4: Base and Upper Cabinets at Coaledo Hall; or as indicated in Drawings.
    - c. Exposed Edges: Same as vertical surfaces.
    - d. Basis-of-Design Product, PLAM-3: Formica Laminate by Panolam Industries International, Inc; [www.panolam.com](http://www.panolam.com).
      - 1) Thickness: 0.8 mm.
      - 2) Color: "Cinder Gray Concrete".
      - 3) Finish: Textured/ Suede (SD).

- 4) Applications: Provide at Upper Cabinets in Lab. Prep. at Sumner Hall; or as indicated in Drawings.
2. Vertical Surfaces at Display Case: Grade VGS.
  - a. Basis-of-Design Product, PLAM-5: High Pressure Laminate by Fenix, a division of Arpa Industriale; [www.fenixforinteriors-na.com](http://www.fenixforinteriors-na.com).
  - b. Color: No. J0717 "Castoro Ottawa".
  - c. Finish: As selected by Architect.
  - d. Application: Provide at interior of Display Case in Coaledo Hall' or as indicated in Drawings.
3. Vertical Surfaces: Grade VGS.
  - a. Basis-of-Design Product, PLAM-6: Removal High Pressure Laminate Panel as selected by Architect.
  - b. Color: As selected by Architect.
  - c. Finish: Matte.
  - d. Application: Provide at Restrooms as indicated in Drawings for Coaledo and Sumner Hall.
4. Horizontal Surfaces: Grade HGS.
  - a. Basis-of-Design Product, PLAM-3: Formica Laminate by Panolam Industries International, Inc; [www.panolam.com](http://www.panolam.com).
    - 1) Thickness: 0.8 mm.
    - 2) Color: "Cinder Gray Concrete".
    - 3) Finish: Textured/ Suede (SD).
  - b. Applications: Provide at Counters of Casework in Control Rooms at Sumner Hall; or as indicated in Drawings.
  - c. Exposed Edges: Same as horizontal surfaces.
- F. Materials for Semiexposed Surfaces:
  1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade CLS.
    - a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
    - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade CLS.
  2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
  3. Drawer Bottoms: Thermoset decorative panels.
- G. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.
- H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

- I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
  1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

## 2.5 SOLID SURFACE COUNTERS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.
  1. Provide inspections of fabrication and installation together with labels and certificates from AWI certification program indicating that countertops comply with requirements of grades specified.
  2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.
- B. Solid surface countertop, fabricated according to manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."
  1. Basis-of-Design Manufacturer, SURF-1: Wilsonart LLC; [www.wilsonart.com](http://www.wilsonart.com).
    - a. Color: No. 9100GS "Coconut Oil".
    - b. Finish: As indicated.
    - c. Dimensions: As indicated.
    - d. Application: Provide at Casework Counters at Sumner Hall; or as indicated on Drawings.
  2. Basis-of-Design Manufacturer: Corian, a division of Dupont; [www.corian.com](http://www.corian.com)
    - a. Color:
      - 1) SURF-2: "Canvas".
      - 2) SURF-3: "Doeskin".
      - 3) SURF-4: "Neutral Concrete".
    - b. Finish: As indicated.
    - c. Dimensions: As indicated.
    - d. Application:
      - 1) SURF-2: Provide at Restroom Counters at Sumner Hall.
      - 2) SURF-3: Provide at Work Room Counters at Coaledo Hall.
      - 3) SURF-4: Provide at Restroom Counters at Coaledo Hall.
      - 4) Or as indicated in Drawings.
  3. Configuration:
    - a. Front: Straight, slightly eased at top with separate apron.
    - b. Backsplash: Straight, slightly eased at corner.
  4. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
    - a. Fabricate with loose backsplashes for field assembly.

2.6 STAINLESS STEEL COUNTERTOP, INTEGRAL SINK AND BACKSPLASH, SS-1

- A. Approved Manufacturers:
  - 1. Air Master Systems, Corp; [www.airmastersystems.com](http://www.airmastersystems.com).
  - 2. Ecolab; [www.bedcolab.com](http://www.bedcolab.com).
  - 3. CiF Lab Solutions LP; [www.cifsolutions.com](http://www.cifsolutions.com).
  - 4. ICIsScientific; [www.iciscientific.com](http://www.iciscientific.com).
  - 5. Kewaunee International Group; [www.kewaunee.com](http://www.kewaunee.com).
  - 6. Mott Manufacturing Ltd. & Mott Manufacturing LLC; [www.mott.ca](http://www.mott.ca).
- B. Countertops: Fabricate from 14-gauge, Type 304 stainless-steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide marine edge at front and end overhang of 1 inch over the base cabinets, and integral sink as indicated in Drawings.
- C. Finish: No. 04.
- D. Joints: Fabricate countertops without field-made joints; weld shop-made joints.
- E. Sound deaden the countertop and sink undersurfaces with heavy-build mastic coating.
- F. Extend the top down to provide a 1-1/2-inch-thick edge with a 1/2-inch return flange, or as indicated.
- G. Form the backsplash coved to and integral with top surface, with a 1/2-inch thick top and side edges and 1/2-inch return flange, or as indicated.
- H. Application: Provide at Lab Prep areas Sumner and Coaledo Hall; as indicated in Drawings.

2.7 MILLWORK REVEAL

- A. Basis-of-Design Product, MWR-1: Millwork Channel L - Angle with Return Key by Fry Reglet Co.; [www.fryreglet.com](http://www.fryreglet.com).
  - 1. Color: no. 1008 Platinum.
  - 2. Finish: Powder coat.
  - 3. Application: Provide at cork tack panel, AWP-2, at Coaledo Hall.

2.8 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 08 71 00 "Door Hardware".
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
  - 1. Basis-of-Design Product: TBD by Continental Hardware; [www.continental-hardware.com](http://www.continental-hardware.com).
    - a. Finish: Satin, stainless steel (SSS).
- D. Catches: Push-in magnetic catches, BHMA A156.9, B03131.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- F. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- G. Closet Rod and Brackets, HDWR-1:
  - 1. Basis-of-Design Product: 770 5 Series Extra-Duty Round Closet Rod & Brackets by Knape & Vogt Manufacturing Company; [www.knapeandvogt.com](http://www.knapeandvogt.com).
  - 2. Dimensions: As Indicated in Drawings.

3. Finish: Satin, stainless steel (SSS).
  4. Application: Provide at Lab Prep. area and Wader Storage in Coaledo Hall; or as indicated in Drawings.
- H. Shelf Brackets, HDWR-2: For attachment to wall at concealed blocking; coordinate with framing/rough carpentry for blocking. Provide set screw installed from below to secure shelf to slide-on bracket.
1. Basis-of-Design Product: 85 Series Standards/ 185 Series Brackets by Knappe & Vogt Manufacturing Company; [www.knappeandvogt.com](http://www.knappeandvogt.com).
  2. Length: As selected by Architect.
  3. Height: 36 inches.
  4. Color: "White"
  5. Application: Provide shelving at Lab Prep. area at Coaledo Hall; or as indicated in Drawings.
- I. Drawer Slides: BHMA A156.9. Full extension, ball bearing type with 150 pound capacity drawers up to 32 inches wide; 200 pound capacity drawers over 32 inches wide; Provide the following basis-of-design products.
1. Standard: Side Mount Slides by Accuride.
  2. Undermount Slide: Undermount Concealed Drawer Slide by Accuride; 150 pound capacity; full extension.
  3. Grade 1: Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel with polymer rollers.
  4. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-overtravel-extension type; zinc-plated-steel ball-bearing slides.
  5. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
  6. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
  7. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
- J. Aluminum Slides for Sliding Glass Doors: BHMA A156.9, B07063.
- K. Sliding Glass Door Hardware, HDWR-3:
1. Basis-of-Design Manufacturer: Roll-Ezy Ball Bearing Track System and Sliding Glass Door Lock by Knappe and Vogt Manufacturing Co.; [www.knappeandvogt.com](http://www.knappeandvogt.com).
  2. Dimensions: As indicated in Drawings.
  3. Finish: Zinc plated steel.
  4. Application: Provide at Hall Display Cases at Coaledo Hall.
- L. Display Case Hardware, HDWR-4:
1. Basis-of-Design Product: SH15C Set, C-Style Tracks and Brackets by Doug Mockett & Company, Inc.; [www.mockett.com](http://www.mockett.com).
  2. Dimensions: As indicated in Detailed Drawings.
  3. Finish: Satin Aluminum.
  4. Application: Provide at Hall Display Cases at Coaledo Hall.



- M. Drawer Locks: Olympus N078 Series with Medeco Keyway complying with Section 08 71 00 "Door Hardware" requirements; non-captive function required. Provide specific model type necessary for the casework configuration and application required.
- N. Door and Drawer Silencers: BHMA A156.16, L03011.
- O. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
  - 1. Satin Stainless Steel: BHMA 630.
- P. Frameless Concealed Hinges: BHMA A156.9, B01602, 180 degrees of opening, 90 degree hinges where door are adjacent to side walls, self-closing; zinc.
  - 1. Product: H7 concealed door hinge by Hafele or similar.
  - 2. Provide number of hinges required for door weight.
- Q. Pulls, Basis-of-Design Product: CTC Hafele Essentials Collection by Häfele America Co.; [www.hafele.com](http://www.hafele.com).
  - 1. Material: Steel.
  - 2. Finish and Color: Satin, Chrome.
  - 3. Size: 96 mm.
  - 4. Or approved equal.
- R. Catches: Magnetic type; Ives 325, 12 lb. pull.
- S. Adjustable Shelf Standards and Supports, Cabinets: Knappe & Vogt 255 - 256 steel painted to match case liner. Install flush to case interior per AWI Section 400A-S-9, Recessed Standards.
- T. Grommets:
  - 1. Basis-of-Design Product, HWDR-5: MM6/ Set, 2 1/2 Inches Solid Brass Cap and Liner Set by Doug Mockett & Company, Inc.; [www.mockett.com](http://www.mockett.com).
    - a. Finish and Color: No. 26D, Satin, Chrome.
    - b. Application: Provide at Control Room in Sumner Hall.
  - 2. Basis-of-Design Product, HWDR-6: Model no. TM2C, Trash Grommet by Doug Mockett & Company, Inc.; [www.mockett.com](http://www.mockett.com).
    - a. Diameter: 8 inches.
    - b. Depth: 3 inches.
    - c. Finish: Satin, stainless steel (SSS).
    - d. Application: Provide at Dental Work Room in Sumner Hall.
- U. Shelving and Counter Brackets:
  - 1. Basis-of Design Products: As scheduled.
  - 2. Finish: Powder coat.
  - 3. Length: As indicated.
  - 4. Coordinate shelf bracket with shelving construction.
- V. Worksurface Supports: 300 pounds load rating per pair, Häfele America Co. Hebgo bracket 287.44 series coordinate with worksurface. 1000 pounds load rating per pair, Hafele Hebgo bracket 287.45 series coordinate with worksurface. Provide one support for every 32 inches of surface unless otherwise indicated.

2.9 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
  - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.10 FABRICATION

- A. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
  - 1. Corners of Cabinets: 1/16 inch unless otherwise indicated.
- B. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
  - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.11 SHOP FINISHING

- A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.
  - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.
- C. Transparent Finish:
  - 1. Grade: Premium.
  - 2. Finish: System - 5, conversion varnish.
  - 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
  - 4. Staining: Clear to match Architect's sample.
  - 5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
  - 6. Filled Finish for Open-Grain Woods After staining, apply wash-coat sealer and allow to dry. Apply paste wood filler and wipe off excess. Tint filler to match stained wood.

7. Sheen: Flat, 15-30 gloss units measured on 60-degree gloss meter per ASTM D523 to match Architect's approved sample.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

#### 3.2 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.3 CABINET INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
  1. For shop finished items use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
  2. Maintain veneer sequence matching of cabinets with transparent finish.
  3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
- G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
  1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

#### 3.4 COUNTERTOP INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
  - C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
  - D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
  - E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
    - 1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
    - 2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
  - F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
  - G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
  - H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
    - 1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
  - I. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."
- 3.5 ADJUSTING AND CLEANING
- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
  - B. Clean, lubricate, and adjust hardware.
  - C. Clean cabinets on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 07 01 50.19 - PREPARATION FOR RE-ROOFING

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. Removal of existing roof and base flashings.
  - 2. Removal of existing sheet metal flashings.
- B. Related Requirements:
  - 1. Section 01 22 00 "Price and Payment Procedures."
  - 2. Section 06 10 00 "Rough Carpentry" for wood nailers for sheet metal flashing and trim integral with roofing.
  - 3. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.

1.3 SUBMITTALS

- A. Photographs: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces that might be misconstrued as having been damaged by re-roofing operations. Submit prior to start of Work.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with affected mechanical and electrical work associated with roof penetrations.
- B. Schedule work to coincide with commencement of installation of new roofing system.

1.5 PREINSTALLATION CONFERENCE

- A. Preinstallation Meeting: Convene one week before starting work of this section.
  - 1. Meet with Owner, Architect, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, sheathing Installer, and installers whose work interfaces with or affects roofing, including installers of roof-mounted equipment.
  - 2. Review preparation and installation procedures related to roofing system tear-off and replacement including, but not limited to, the following:
    - a. Verify items to be removed and items to remain or to be reinstalled.
    - b. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, facilities needed to make progress and avoid delays.
    - c. Review re-roofing preparation, including membrane roofing system manufacturer's written instructions.
    - d. Existing roof drains and roof drainage during each stage of re-roofing and roof drain plugging and plug removal requirements.
    - e. Examine sheathing substrate conditions and finishes for compliance with requirements, including flatness and fastening.

- f. Review structural loading limitations of roof deck.
- g. Review temporary protection requirements for existing and new roofing system.
- h. Review protection requirements for interior spaces, both occupied and unoccupied, of the building.
- i. Review base flashing, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect reroofing.
- j. Shutdown of fire-suppression, fire-protection and fire alarm and detection systems.
- k. Timing and sequencing for shutdown of existing MEP equipment located on the roof.
- l. Existing conditions that may require notification of Architect before proceeding.

#### 1.6 QUALITY ASSURANCE

- A. Materials Removal Firm Qualifications: Installer of new membrane roofing system.

#### 1.7 FIELD CONDITIONS

- A. Do not remove existing roofing membrane when weather conditions threaten the integrity of the building contents or intended continued occupancy.
- B. Maintain continuous temporary protection prior to and during installation of new roofing system.
- C. Protect existing building to be re-roofed, adjacent buildings, walkways, exterior plantings and landscaping from damage or soiling from re-roofing operations.
- D. Limit overall roof loads and equipment wheel loads on existing roofing to avoid damage to areas not scheduled for immediate replacement.
- E. Weather Limitations: Proceed with roofing preparations only when existing and forecasted weather conditions permit work to proceed without water entering the building.
- F. Owner will occupy portions of building immediately below re-roof areas. Conduct re-roofing so Owner's operations will not be disrupted. Provide Owner with not less than 48 hours' notice of activities that may affect Owner's operations.
  - 1. Place protective dust or water leakage covers over sensitive equipment or furnishings. Coordinate with Owner the shutdown of HVAC and/or fire-alarm or detection equipment if needed and the evacuation of occupants from below the work area(s) when/if necessary.
  - 2. Before working over structurally impaired areas of sheathing, if any are discovered, notify Owner to evacuate occupants from below the affected area. Verify that occupants below the work area have been evacuated before proceeding with work over the impaired deck area.
- G. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- H. Coordinate with Owner for timing of disconnection of existing mechanical equipment to permit continued possible operation of the existing facility during roof replacement activities.

#### 1.8 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
  - 1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof level rigid insulation, walkway products, underlayments and other components of roofing system.
  - 2. Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Protection Membrane: Provide minimum 45-mil Thermoplastic Polyolefin (TPO) Roofing single ply roof membrane with watertight sealed seams for use as protective coverings at roof repair and replacement locations exposed during the work. Provide weights, mechanical attachment, or approved adhesives, to retain TPO single ply membrane in position.
  - 1. Use minimum 45-mil TPO single ply roof membrane covering with sealed seams as necessary as a temporary means to prevent moisture intrusion into building interior.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that existing roof surface is clear and ready for work of this Section.
- B. Inspect existing substrate, sheet metal flashings, nailers and sheathing for deterioration and damage. If nailers and/ or sheathing have deteriorated, immediately notify Architect.

### 3.2 PREPARATION

- A. Sweep roof surface clean of loose matter.
- B. Remove loose refuse and dispose off site.
- C. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work, when applicable. Cover air-intake louvers before proceeding with re-roofing work that could affect indoor air quality or activate smoke detectors in the ductwork.
- D. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- E. Maintain roof drainage ways in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking drainage ways.

### 3.3 MATERIAL REMOVAL

- A. Remove only existing roofing materials that can be replaced with temporary roofing or new materials the same day.
- B. Remove sheet metal flashing and trim as indicated on Drawings.
- C. Remove roofing membrane, perimeter base flashings, flashings around roof protrusions down to existing roof sheathing.
- D. Remove existing cant strips, damaged wood blocking, nailers, and other components not shown on Drawing details, unless considered detrimental to system performance.
- E. Repair existing cementitious wood fiber deck, add wood sheathing surfaces as necessary to provide smooth working surface for new roof assembly.
- F. If existing deck surfaces are not suitable for new roofing, or if structural integrity is suspect, notify Architect immediately.
- G. Existing Sheet Metal Flashing and Wall Panels: Where indicated as "existing", do not damage sheet metal flashings and wall panels associated with work to be performed or elsewhere during daily working activities.

### 3.4 ROOF TEAR-OFF

- A. General: Notify Owner each day of extent of roof tear-off proposed for that day.

- B. Sheet Metal Removal: Detach and recycle existing sheet metal flashings where new flashings are to be installed as shown on the Drawings.
  - 1. Avoid damaging existing sheet metal flashings that are to remain.
  - 2. Existing flashings or metal elements that will remain but that are damaged beyond acceptable use are to be replaced with new flashing or elements that match existing.
  - 3. Immediately offload and transport sheet metal flashing to locations indicated by the Owner as conditions allow until permanent disposal is performed.

### 3.5 INFILL MATERIALS INSTALLATION

- A. After roof tear off, substrate inspection and repair, fill in tear-off areas with roof assembly.
  - 1. Installation of infill materials is specified in Section 07 54 23 "Thermoplastic Polyolefin (TPO) Roofing" for 2-ply built-up roof system over roof level insulation assembly.
  - 2. Installation of wood blocking, curbs, nailers and wall sheathing is specified in Section 06 10 00 "Rough Carpentry".

### 3.6 FASTENER PULL-OUT TESTING

- A. Perform fastener pull-out tests according to SPRI FX-1 and submit test report to Architect and Consultant before installing new roofing system.

### 3.7 PROTECTION

- A. Provide temporary minimum 45-mil TPO single ply roof membrane with sealed seams as protective covering over uncovered sheathing surfaces and as needed at other locations to establish temporary watertight conditions.
- B. Turn TPO single ply membrane up and over curbing. Retain TPO single ply membrane in position with weights.
- C. Provide for surface drainage from TPO single ply membrane to existing drainage facilities. Do not allow TPO singly ply membrane to pond water.
- D. Do not permit traffic over unprotected or repaired sheathing surface.
- E. Protect interior and adjacent exterior areas from construction activities, damage, and debris.

### 3.8 DISPOSAL

- A. Adhere to Contractor's Waste Management Plan as specified in Section 01 74 19 "Construction Waste Management and Disposal".
- B. Collect demolished materials and place in containers. Promptly dispose of demolished materials not indicated to be recycled. Do not allow demolished materials to accumulate on-site. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION



## SECTION 07 21 00 - THERMAL INSULATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Thermal batt insulation, mineral wool, unfaced (INSUL-1).
  - 2. Glass-fiber blanket insulation (INSUL-2).
  - 3. Extruded polystyrene (XPS) rigid board insulation (INSUL-5).
  - 4. Vapor retarder (VB-1).
- B. Related Requirements:
  - 1. Section 07 54 23 "Thermoplastic Polyolefin (TPO) Roofing" for roofing insulation (INSUL-3).
  - 2. Section 09 29 00 "Gypsum Board" for acoustic insulation at interior partitions.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

#### 1.4 DEFINITIONS

- A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blankets with latter formed into batts (flat-cut lengths) or rolls.

#### 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 1. Surface-Burning Characteristics: One of the following standards shall apply:
    - a. ASTM E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"
  - 2. Fire-Resistance Ratings: One of the following standard shall apply:
    - a. ASTM E119 "Standard Test Methods for Fire Tests for Building Construction and Materials"
    - b. ISO 834 - Parts 1 and 3-9 "Fire Resistance Tests - Elements of Building Construction."

3. Combustion Characteristics: One of the following standards shall apply:
    - a. ASTM E136 "Standard Test method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees Celsius"
  - C. Formaldehyde-Free: Batt insulation products shall not contain formaldehyde (or formaldehyde precursors). Provide Third Party Certification with UL Environmental Claim Validation; industries.ul.com.
  - D. Recycled Content: Batt insulation products shall contain a minimum of 50 percent post-consumer recycled glass content. Provide UL Environmental Claim Validation; industries.ul.com.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
  - B. Protect foam-plastic board insulation as follows:
    1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
    2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
    3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

## PART 2 - PRODUCTS

### 2.1 MINERAL-WOOL BATT INSULATION, INSUL-1

- A. Mineral-Wool Blanket, Unfaced Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.
  1. Basis-of-Design Product: Comfortbatt by Rockwool (formerly Roxul); www.rockwool.com.
  2. Applications: Provide at exterior wall cavities; as indicated on Drawings.

### 2.2 GLASS-FIBER BATT INSULATION, INSUL-2

- A. Glass-Fiber Blanket Insulation, Unfaced: ASTM C665, Type I; passing ASTM E136 for combustion characteristics; R-3.2 per inch. No added formaldehyde.
  1. Approved Products:
    - a. Formaldehyde-Free Fiberglass Insulation by Johns Manville; www.johnsmanville.com.
    - b. EcoBatt (Unfaced) by Knauf; www.knaufinsulation.us.
    - c. EcoTouch Pink Fiberglas Insulation by Owens Corning; www.owenscorning.com.
  2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
  3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
  4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
  5. Application: As indicated on Drawings.

2.3 INSUL-3

- A. Refer to section 07 54 23 "Thermoplastic Polyolefin (TPO) Roofing".

2.4 INSUL-4

- A. Not used.

2.5 EXTRUDED POLYSTYRENE (XPS) FOAM-PLASTIC BOARD, INSUL-5

- A. Extruded Polystyrene Board Insulation, Type IV: ASTM C578, Type IV, 25-psi minimum compressive strength; unfaced.
1. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
  2. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
  3. R-value: R-5.0 per inch of thickness.
    - a. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
  4. Thickness: As indicated or as required by Code.
  5. Basis-of-Design Product: Foamular 250 by Owens Corning; [www.owenscorning.com](http://www.owenscorning.com).
  6. Application: As indicated on Drawings.

2.6 VAPOR RETARDER, VB-1

- A. Sheet Vapor Retarder: Polyamide film vapor retarder for use with unfaced, vapor permeable glass fiber and mineral wool insulation in wall and ceiling cavities. Material shall have a permeance of 1 perm or less when tested to ASTM E86, dry cup method and permeability shall increase to greater than 10 perms when tested to ASTM E86, wet cup method.
1. Water Vapor Permeance:
    - a. ASTM E86, dry cup method: Maximum of 1.0 perm (57ng/Pa\*s\*m2).
    - b. ASTM E86, wet cup method: Minimum of 10.0 perms (1144ng/Pa\*s\*m2).
  2. Fire Hazard Classification: ASTM E 84:
    - a. Maximum Flame Spread Index; 20.
    - b. Maximum Smoke Developed Index; 55.
  3. Basis-of-Design Product: MemBrain by CertainTeed, Div. of Saint Gobain; [www.certainteed.com](http://www.certainteed.com).
    - a. Application: Interior face of wood framed exterior walls and roofs.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- C. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.

2.7 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.

- B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
  - 1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
    - a. Ceiling plenums.
- C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

## 2.8 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
  - 1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
  - 2. Spray Polyurethane Foam Insulation, INSUL 4: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation, or that interfere with insulation attachment.

### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

### 3.3 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
  - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
  - 2. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
  - 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
  - 4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

### 3.4 INSTALLATION OF CAVITY-WALL INSULATION

- A. Polyisocyanurate Board, OSB Faced: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
  - 1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose.

### 3.5 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
  - 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
  - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
  - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
    - a. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked.
    - b. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.
- C. Loose-Fill Insulation: Apply according to ASTM C1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

### 3.6 INSTALLATION OF VAPOR RETARDERS ON FRAMING

- A. Place vapor retarders on side of construction indicated on Drawings.
- B. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives, vapor retarder fasteners, or other anchorage system as recommended by manufacturer. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- C. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs and sealing with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.

- D. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- E. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.7 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

## SECTION 07 25 00 - WEATHER BARRIERS

### 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. Fluid-applied, vapor-permeable membrane air barrier (WRB-1).
  - 2. Liquid-applied flashing membrane (F-5).
  - 3. Self-adhered transition membranes (SAM-1, SAM-2 and SAM-3).
- B. RELATED REQUIREMENTS:
  - 1. Section 03 30 00 "Cast-in-Place Concrete" for vapor retarders below concrete slabs-on-grade.
  - 2. Section 06 16 00 "Sheathing" for substrate preparation coordination.
  - 3. Section 07 92 00 "Joint Sealants" for sealants between finishes and not specified in this section.
  - 4. Division 08 "Openings" sections for openings receiving air barrier transition assemblies specified in this Section.

#### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate installation of joint sealants with cleaning of joint sealant substrates and other operations that may impact installation or finished joint sealant work.
- B. Preinstallation Conference: Conduct conference at Project Site.
- C. Review requirements for air barrier products and installation, project and manufacturer's details, mockups, testing and inspection requirements, and coordination and sequencing of air barrier work with work of other Sections.
- D. Review manufacturer's instructions for air barrier application meeting Project requirements for substrates specified, including three-dimensional video model demonstrating proper application of components at wall openings.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of air barrier product specified, including:
  - 1. Technical data indicating compliance with requirements.
  - 2. Substrate preparation instructions and recommendations.
- B. Shop Drawings: Show locations for air barrier. Show details for each type of substrate, joints, and edge conditions, including flashings, counterflashings, penetrations, transitions, and terminations.
  - 1. Show location of transition and accessory materials providing connectivity throughout the assemblies.
  - 2. Provide manufacturer provided details for transitions indicated.

- C. Qualification Data: For Installer, manufacturer, and Air Barrier Inspector.
  - 1. Certification of manufacturer's approval of Installer.
  - 2. Certification of ABAA accreditation of Installer firm and list of Installer's ABAA-certified installers and supervisors on Project.
- D. Manufacturer's Product Compatibility Certificate: Certify compatibility of air barrier products with adjacent materials.
  - 1. Certify compatibility with bituminous dampproofing.
  - 2. Certify compatibility with below-grade waterproofing.
- E. Low-Emitting Product Certificate: For air barrier products specified to meet volatile organic emissions standards, submit Greenguard Children and Schools Certification or comparable certification acceptable to Contracting Officer.
- F. Fire Propagation Characteristics Certificate: From a qualified testing agency, documentation that air barrier system as a component of a wall assembly has been tested and passed NFPA 285. Include system classification number of testing agency on shop drawings.
- G. Product Test Reports: Test data for air barrier products and air barrier assembly, by qualified testing agency, indicating proposed membrane air barrier meets performance requirements, when requested by Contracting Officer.
- H. Warranty: Sample of unexecuted manufacturer and installer special warranties.
- I. Field quality control reports.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm with minimum three years experience in installation of specified products in successful use on similar projects, employing workers trained by manufacturer, including a full-time on-site supervisor with a minimum of three years experience installing similar work, able to communicate verbally with Contractor, Contracting Officer, and employees.
  - 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.
- B. Manufacturer Qualifications: A qualified manufacturer listed in this Section with minimum five years experience in manufacture of air barrier membrane as one of its principal products.
- C. Air Barrier Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified air barrier system, qualified to perform observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Inspector shall be one of the following:
  - 1. An authorized full-time technical employee of the manufacturer.
  - 2. An independent party certified as an air barrier inspector by the ABAA or other certifying organization acceptable to Contracting Officer, retained by the Contractor.
- D. Building Mockups: Coordinate provision of scope in this Section to free-standing Building Mockups; refer to Division 01 "General Requirements".
- E. Mockups: Provide air barrier mockup application within mockups required in other Sections, or if not specified, in an area of not less than 150 sq. ft. of wall surface where directed by Contracting Officer for each type of backup wall construction. Include examples of surface preparation, crack and joint treatment, air barrier application, and flashing, transition, and termination conditions, to set quality standards for execution.
  - 1. Include intersection of wall air barrier with roof air barrier and with foundation wall intersection.



1.6 DELIVERY, STORAGE AND HANDLING

- A. Accept materials on site in manufacturer's unopened original packaging.
- B. Store products in weather protected environment, clear of ground and moisture, within temperature ranges recommended by air barrier manufacturer.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Environmental Limitations:
  - 1. Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.
  - 2. Protect substrates from environmental conditions that affect air-barrier performance.
  - 3. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.8 SCHEDULING

- A. Coordinate installation of membrane air barrier with completion of roofing and other work requiring interface with air barrier.
- B. Schedule work so air barrier applications may be inspected prior to concealment.
- C. Ensure air barrier materials are cured before covering with other materials.

1.9 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which air barrier manufacturer agrees to furnish and install air barrier material to repair or replace those materials installed according to manufacturer's written instructions that exhibit material defects or otherwise fail to perform as specified under normal use within warranty period specified.
  - 1. Access for Repair: Government shall provide unimpeded access to the Project and the air barrier system for purposes of testing, leak investigation, and repair, and shall reinstall removed cladding materials upon completion of repair.
  - 2. Cost Limitation: Manufacturer's obligation for repair or replacement shall be limited to the original installed cost of the work.
  - 3. Warranty Period: ten (10) years date of Substantial Completion.
- B. Special warranties specified in this article exclude deterioration or failure of air barrier materials from the following:
  - 1. Movement of the structure caused by structural settlement or stresses on the air barrier exceeding manufacturer's written specifications for elongation.
  - 2. Mechanical damage caused by outside agents.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Membrane air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a moisture drainage plane transitioned to adjacent flashings and discharging water to the building exterior. Membrane air barriers shall accommodate substrate movement and seal expansion and control joints, construction material transitions, opening transitions, penetrations, and perimeter conditions without moisture deterioration and air leakage exceeding performance requirements.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. when tested according to ASTM E 2357.

- C. Fire Propagation Characteristics: Provide air barrier system qualified as a component of a comparable wall assembly that has been tested and passed NFPA 285.

## 2.2 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Prosoco, Inc.; [www.prosoco.com](http://www.prosoco.com).
- B. Other Approved Manufacturers:
  - 1. Soprema; [www.soprema.us](http://www.soprema.us).
  - 2. Tremco, Inc.; [www.tremcosealants.com](http://www.tremcosealants.com).
- C. Source Limitations: Obtain air-barrier materials from single source from single manufacturer.

## 2.3 MATERIALS, GENERAL

- A. Comply with 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. Compatibility: Provide membrane air barrier materials that are compatible with one another and with adjacent materials under conditions of service and application required, as demonstrated by membrane air barrier manufacturer based on testing and field experience.

## 2.4 MEMBRANE AIR BARRIER

- A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier, WRB-1: Single-component, silyl-terminated-polymer (STP); roller-applied to produce a highly durable, seamless, elastomeric weatherproofing membrane. May be applied in unfavorable weather conditions to dry or damp surfaces.
- B. Basis of Design Product: R-Guard Cat 5 by Prosoco.
  - 1. Vapor Permeance, ASTM E96: Minimum 18 perms.
  - 2. Elongation, Ultimate, ASTM D412, Die C: 250 percent, minimum.
  - 3. Combustion Characteristics: Class A, flame spread, not greater than 25; smoke developed, not greater than 450, per ASTM E 84.
  - 4. VOC Content: Less than 30 g/L.
- C. Other Approved Products:
  - 1. Sopraseal LM 204 VP by Soprema.
  - 2. ExoAir 230 by Tremco, Inc.

## 2.5 TRANSITION MEMBRANE

- A. Liquid-Applied Flashing Membrane, F-5: Single-component, silyl-terminated-polymer (STP) waterproofing, adhesive and detailing compound for seamless, elastomeric flashing membrane. Use to adhere, transition and counter-flash through-wall sheet flashing.
  - 1. Basis of Design Product: R-Guard FastFlash by Prosoco.
  - 2. VOC Content: Less than 30 g/L.
- B. Self-Adhered Transition Membranes:
  - 1. Transition Membrane, SAM-1: Butyl, 24 mil thick, self-adhering composite sheet consisting of butyl laminated to high-density polyethylene (HDPE) film; coated on one side with recycled butyl adhesive.
    - a. Basis of Design Product: Wrapshield SA Self-Adhered by Vaproshield;

[www.vaproshield.com](http://www.vaproshield.com).

- b. Application: Membrane flashings for transition applications where sealants WILL NOT be in contact with the transition membrane.
- 2. High Temperature, Foil-Faced Transition Membrane (Foil-Face Transition) SAM-2: Butyl, 45 mil thick, self-adhering composite sheet consisting of butyl laminated to high-density polyethylene (HDPE) film laminated to an aluminum foil; coated on one side with a high-temperature recycled butyl adhesive.
  - a. Basis of Design Product: R-Guard SS ThruWall by Prosoco.
  - b. Other Approved Product: Vapro SS Flashing by Vaproshield; [www.vaproshield.com](http://www.vaproshield.com).
  - c. Thermally stable at in-service temperature up to 300 deg F (149 deg C).
  - d. Applications: Membrane flashings for transition applications where sealants WILL be in contact with the transition membrane, for proper adhesion.
- 3. High Temperature, Transition Membrane (Hi-Temp Transition), SAM-3: Butyl, 24 mil thick, self-adhering composite sheet consisting of butyl laminated to high-density polyethylene (HDPE) film; coated on one side with a high temperature recycled butyl adhesive.
  - a. Basis of Design Product: Grace Ultra by GCP Applied Technologies; [www.gcpat.com](http://www.gcpat.com).
  - b. Thermally stable at in-service temperature up to 300 deg F (149 deg C).
  - c. Application: Membrane flashings for transition applications where sealants WILL NOT be in contact with the transition membrane.

## 2.6 ACCESSORY MATERIALS

- A. General: Accessory materials as described in manufacturer's written installation instructions, recommended to produce complete air barrier assembly meeting performance requirements, and compatible with air barrier membrane material and adjacent materials.
- B. Primer: Liquid primer meeting VOC limitations, recommended for substrate by membrane air barrier manufacturer, when installing modified bituminous self-adhered membranes.
- C. Reinforcing Fabric: High strength mesh fabric consisting of open-weave glass fiber saturated with synthetic resins formulated for high moisture resistance, for reinforcing of liquid applications.
- D. Liquid Joint Sealants:
  - 1. ASTM C920, single-component, fiber-reinforced, silyl-terminated-polymer (STP) gun-grade detailing compound suitable for all climates; approved by air barrier manufacturer for adhesion and compatibility with membrane air barrier and accessories.
    - a. Basis of Design Product: R-Guard Joint & Seam Filler by Prosoco.
    - b. Applications: Joints ranging from 3/8-inch to 1-inch, with backer rod.
  - 2. ASTM C920, single-component, silyl-terminated-polymer (STP) gun-grade detailing compound suitable for all climates; approved by air barrier manufacturer for adhesion and compatibility with membrane air barrier and accessories.
    - c. Basis of Design Product: R-Guard Air Dam by Prosoco.
- E. Sprayed Foam Sealant: Polyurethane, low-expanding foam sealant; foamed-in-place, 1.5- to 2.0-lb/cu. ft. density, with flame-spread index of 25 or less per ASTM E 162, for filling of gaps at openings and penetrations; approved by air barrier manufacturer for adhesion and compatibility with membrane air barrier and accessories.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Surface Condition: Before applying air barrier materials, examine substrate and conditions to ensure substrates are fully cured, smooth, clean, dry, and free from high spots, depressions, loose and foreign particles and other deterrents to adhesion, and conditions comply with manufacturer's written recommendations.
- B. Verify concrete and masonry surfaces are visibly dry, have cured for time period recommended by membrane air barrier manufacturer, and are free from release agents, curing agents, and other contaminants.
- C. Test for capillary moisture by method recommended in writing by air barrier manufacturer..
- D. Verify masonry joints are filled with mortar and struck flush.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INTERFACE WITH OTHER WORK

- A. Commencement of Work: Commence work once air barrier substrates are adequately protected from weather and will remain protected during remainder of construction.
- B. Sequencing of Work: Coordinate sequencing of air barrier work with work of other Sections that form portions of building envelope air barrier to ensure that flashings and transition materials can be properly installed and inspected. Roofing systems shall be capped and sealed, or top of walls protected, in such a way as to eliminate the ability of water to saturate the wall or interior space, both before and after, air barrier system installation. Coordinate installation of fluid-applied membrane air barrier with the roofing trade to ensure compatibility and continuity with the roofing system.
- C. Subsequent Work: Coordinate air barrier work with work of other Sections installed subsequent to air barrier to ensure complete inspection of installed air barrier and sealing of air barrier penetrations necessitated by subsequent work.

#### 3.3 PREPARATION

- A. Clean, prepare, and treat substrate in accordance with air barrier manufacturer's written instructions.
- B. Mask adjacent finished surfaces.
- C. Remove contaminants and film-forming coatings from substrates.
- D. Remove projections and excess materials and fill voids with substrate patching material.
- E. Prepare and treat joints and cracks in substrate per ASTM C1193 and membrane air barrier manufacturer's written instructions.
- F. Walls and wall penetrations receiving fluid-applied membrane air barrier and related accessories: Review and strictly follow application instructions for all utilized materials, consulting with manufacturer's rep. during pre-construction/mock-up phase.
  - 1. Upon removal of old cladding, inspect substrate for any remaining conditions which violate the fluid-applied membrane air barrier application preparation instructions:
    - a. Protruding objects: to be ground or cut off to provide a uniform flat surface.
    - b. Changes in plane: Grind concrete to create clean edge suitable to follow manufacturer's instructions for application at a plane change.
    - c. Rust: to be removed to "white metal" and primed with manufacturer-approved primer or corrosion inhibitor.

- d. Uneven or broken surfaces: Remove all loose material and laitance, apply manufacturer-approved bonding agent, and sack-patch with manufacturer-approved concrete repair product(s).
  - 1) Larger areas may require forming and pouring or structural attachment, submit plan of such areas for structural review.
- e. Depressions, bubbles, pinholes and holidays: Grind, abrade, or wire-brush areas to knock shoulders down, and/ or apply manufacturer-approved polymer-modified repair mortar.

### 3.4 APPLICATION OF ACCESSORY MATERIALS

- A. General: Install strips, transition strips, and accessory materials according to air-barrier manufacturer's written instructions. Install transition materials and other accessories to form connect and seal membrane air barrier material to adjacent components of building air barrier system, including, but not limited to, roofing system air barrier, exterior fenestration systems, door framing, and other openings.
- B. Primer: Apply primer to substrates when recommended by air barrier manufacturer at required rate for those substrates that will be receiving a modified bituminous self-adhered membrane. Reprime areas not covered within 24 hours.
- C. Assembly Transitions: Connect and seal exterior wall air barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- D. Opening Transitions: Fill gaps at perimeter of openings with foam sealant and apply approved transition or accessory material
- E. Penetrations: Fill gaps at perimeter of penetrations with foam sealant and level with approved sealant. or seal transition strips around penetrating objects and terminate with approved sealant.
- F. Joints: Bridge and cover isolation joints, expansion joints, and discontinuous joints between separate assemblies utilizing approved transition or accessory materials.
- G. Changes in Plane: Apply approved sealant beads at corners and edges to form smooth transition.
- H. Substrate Gaps: Cover gaps with stainless steel sheet mechanically attached to substrate and providing continuous support for air barrier.
- I. Flashings: Seal top of through-wall flashings to membrane air barrier with a continuous bead of approved sealant recommended by air barrier manufacturer.
- J. Seal punctures, voids, and seams. Patch with approved transition and accessory materials following air barrier manufacturer's recommendations and extend repair beyond repaired areas to maintain continuity.

### 3.5 FLUID AIR-BARRIER MEMBRANE INSTALLATION

- A. General: Apply fluid air-barrier material to form a seal with transition materials and accessories to achieve a continuous air barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.
- B. Membrane Air Barrier: Apply fluid air barrier material in full contact with substrate to produce a continuous seal according to membrane air barrier manufacturers written instructions.
- C. Vapor-Permeable Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, -in a range of 25 – 35 mils dry film thickness depending on substrate, applied in one or more equal coats, roller- or spray- applied.

- D. Connect and seal exterior wall air-barrier membrane continuously to subsequently-installed roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, wall openings, and other construction used in exterior wall openings, using approved transitions and accessory materials.
- E. Wall Openings: Apply approved sealant to adhere silicone extrusion to perimeter of windows, curtain walls, storefronts, doors, and louvers. Apply opening transition assembly and preformed silicone sealant extrusion according to air barrier transition manufacturer's written instructions.
- F. Seal punctures, voids, and seams. Patch with approved transition and accessory materials following air barrier manufacturer's recommendations and extend repair beyond repaired areas to maintain continuity.
- G. Do not cover air barrier until it has been tested and inspected by Government's testing agency.
- H. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

### 3.6 CLEANING AND PROTECTING

- A. Clean spills, stains, and overspray resulting application utilizing cleaning agents recommended by manufacturers of affected construction. Remove masking materials.
- B. Protect membrane air barrier from damage from subsequent work. Protect membrane materials from exposure to UV light for period in excess of that acceptable to membrane air barrier manufacturer; replace overexposed materials and retest.

END OF SECTION

## SECTION 07 46 46 - FIBER-CEMENT SIDING

### 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. Fiber-cement siding for exterior applications (FIBER CEMENT PNL 1).
  - 2. Cladding support system, including insect screen.
- B. Related Requirements:
  - 1. Section 06 10 00 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.
  - 2. Section 07 62 00 "Sheet Metal Flashing and Trim" for flashings to be used in fiber-cement siding assemblies.
  - 3. Section 07 92 00 "Joint Sealants".

#### 1.3 COORDINATION

- A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. During the pre-construction meetings, review the approved design intent and methods required. Repeat this review during the preparation for assembly of the exterior systems mockup.

#### 1.5 SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For fiber-cement siding. Include elevations, sections, full-size details, and attachment to other Work.
  - 1. Include details of transitions to other Work.
  - 2. Include joint pattern and horizontal and vertical joint details.
  - 3. Include fastener pattern for review for spacing. Include fastener type, size and material.
  - 4. Include expansion provisions.
  - 5. Include Project specific details.
- C. Samples for Verification: For each type, color, texture, and pattern required.
  - 1. 12-inch-long-by-actual-width Sample of siding.
  - 2. 24-inch-wide-by-36-inch-high Sample panel of siding assembled on plywood backing.
- D. Product Certificates: For each type of fiber- cement siding and soffit.

- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.
  - F. Research/Evaluation Reports: For each type of fiber-cement siding required, from ICC-ES.
  - G. Sample Warranty: For special warranty.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.
- 1.7 MAINTENANCE MATERIAL SUBMITTALS
- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
    - 1. Furnish full lengths of fiber- cement siding and soffit including related accessories, in a quantity equal to 2 percent of amount installed.
- 1.8 QUALITY ASSURANCE
- A. Installer Qualifications: All products listed in this section are to be installed by a single installer trained and approved by the fiber-cement siding manufacture or manufacturer's representative.
  - B. Color Evaluation: No visible change, 2000 hours of accelerated weathering with color evaluation when calculated to ASTM D2244-09a.
  - C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation. Refer to Section 01 30 00 "Administrative Requirements".
    - 1. Build mockup of typical wall area as shown on Drawings.
      - a. Include outside corner on one end of mockup and inside corner on other end.
    - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
    - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- 1.9 DELIVERY, STORAGE, AND HANDLING
- A. Deliver and store packaged materials in original containers with labels intact until time of use.
  - B. Store materials on elevated platforms, under cover, and in a dry location.
- 1.10 PROJECT CONDITIONS
- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits or which could involve life safety situations.
  - B. Field Measurements: Verify actual measurements/openings by field measurements performed by the installer prior to fabrication. The General Contractor or Installer shall be responsible for existing site dimensions. Recorded measurements shall be indicated on shop drawings based on field measurements provided by the installer. Coordinate field measurements and fabrication schedule.



1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including cracking and deforming.
    - b. Deterioration of materials beyond normal weathering.
  - 2. Warranty Period:
    - a. Interior: 10 years from date of Substantial Completion for defects in materials when installation is by a contractor trained and approved by manufacturer's representative.
    - b. Exterior: 30 years from date of Substantial Completion for defects in materials when installation is by a contractor trained and approved by manufacturer's representative.
  - 3. Workmanship Warranty, Exterior: Application limited warranty for 2 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer for each type of fiber-cement siding indicated.
- B. Basis-of-Design Manufacturer: James Hardie Building Products, Inc.; [www.jameshardie.com](http://www.jameshardie.com).

2.2 FIBER-CEMENT SIDING

- A. General: ASTM C1186 and EN 12467, fiber-cement board, noncombustible; with a flame-spread index of 25 or less when tested according to ASTM E84.
  - 1. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C1186 or EN 12467 by a qualified testing agency acceptable to authorities having jurisdiction.
- B. Fiber-Cement Siding, FIBER CEMENT PNL 1:
  - 1. Basis-of-Design Product: Large Smooth Panel Siding by James Hardie.
  - 2. Texture: Smooth.
  - 3. Exposed Width: As selected by Architect.
  - 4. Thickness: 5/16-inch.
  - 5. Color: As selected by Architect.
  - 6. Installation Orientation: Vertical.
  - 7. Applications: As indicated.

2.3 CLADDING SUPPORT SYSTEM

- A. Furring Strips: APA Exterior rated plywood, thickness and widths as indicated, pressure preservative treated.
- B. Shims: Load bearing, high-density multimonomer plastic, nonleaching.
- C. Mechanical Fasteners: Elco Dril-Flex or Hilti Kwik-Flex conforming to ICC Legacy Report ER-4780, or Los Angeles Department of Building and Safety Research Report RR 25095, dual hardner, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws. The self-drilling

point lead tapping threads shall have a minimum hardness of HRL. The load bearing screen shank shall have a maximum of hardness of HRL 34

1. Head Type: Hex washer head, Undercut flathead, custom head styles as noted on drawings.
  2. Finish heads to be black where exposed to view.
- D. Insect Screens: Provide insect screen cloth to prevent intrusion to rainscreen cavity space behind siding.
1. Glass-Fiber Mesh Fabric: Mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D3656.
    - a. Mesh Color: Black.

## 2.4 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration and as required for complete installation.
1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.
- B. Decorative Accessories: Provide the following fiber-cement decorative accessories as indicated:
1. Corner posts.
  2. Door and window casings.
  3. Fasciae.
  4. Moldings and trim.
- C. Flashing: Provide flashing and trim complying with Section 07 62 00 "Sheet Metal Flashing and Trim" where indicated.
- D. Fasteners: Exposed fasteners.
1. Exterior: Siding nails of sufficient length to penetrate a minimum of 1 inch into substrate.
  2. For fastening fiber cement, use stainless-steel fasteners at exterior.
- E. Insect Screen: Provide at sills and bottom of walls wrapping furring as indicated.
1. Material: Polyester.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber- cement siding and soffit and related accessories.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

### 3.3 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Do not install damaged components.
  2. Provide trim profiles where indicated.
  3. Vent bottom of wall assemblies with continuous metal, perforated vent.
  4. Insect Screens: Install insect screen cloth at all openings to rainscreen cavity space behind siding.
  5. Fill face of countersink screws with patch material recommended by manufacturer, sand smooth and paint material to match color of fiber-cement siding.
- B. Install joint sealants as recommended by siding manufacturer, where indicated, and as specified in Section 07 92 00 "Joint Sealants."
- C. Align panels horizontally with panel stripes not varying more than 1/32 inch between panels, and 1/8 inch in 10 feet, non-cumulative.
- 3.4 ADJUSTING AND CLEANING
- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION

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## SECTION 07 54 23 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

### 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. Fully adhered TPO (thermoplastic polyolefin) roofing system (TPO-1).
2. Vapor retarder (VB-3).
3. Roof insulation (INSUL-3).
4. Walkway pads.

##### B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based.
2. Section 06 16 00 "Sheathing" for parapet sheathing.
3. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counter flashings.
4. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
5. Division 22 "Plumbing " for coordination with roof and overflow drains.
6. Division 32 "Exterior Improvements" Sections for soil and plant materials installed over TPO roofing.

#### 1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

#### 1.4 COORDINATION

- A. Vapor retarder shall be installed prior to installing roof drains and other penetrations through the vapor retarder membrane. The contractor shall be responsible for sequencing the installation of vapor retarder/ temporary roofing prior to installation and be responsible for corrective measures if installation sequencing is not followed.
- B. Coordinate installation required with roof tie-offs.

#### 1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Roofing Conference: Conduct conference at Project site.
  1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
  2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

#### 1.6 SUBMITTALS

- A. Product Data: For each type of product.
- B. Compatibility Letter and Chart:
  1. Provide a Compatibility Letter certifying physical and chemical compatibility of products in this section with all other dampproofing, waterproofing, weather barrier, roofing, self-adhered flashing and sealant products in the Project.
  2. Provide input from this work toward a single Compatibility Chart to be compiled by the General Contractor. Compatibility Chart shall indicate:
    - a. All dampproofing, waterproofing, weather barrier, roofing, self-adhered flashing and sealant products.
    - b. Which other products from this group they interface (are in contact with) in the Project.
    - c. The physical and chemical compatibility between those interfaced products.
- C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
  1. Roof plan showing outline, orientation and type of roof deck and orientation of roofing.
  2. Roof slope and designated direction of slope.
  3. Locations and types of all penetrations.
  4. Locations of walk pads.
  5. Locations of roof rock overburden, if applicable.
  6. Provide unique base flashing, penetration, roof tie-offs, perimeter and termination details.
  7. Membrane sheet sizes and layout.
  8. Tapered insulation, including slopes.
  9. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
  10. When field conditions necessitate modifications to the previously approved shop drawings, a copy of the shop drawing indicating all modifications must be submitted to the membrane manufacturer for revision and approval prior to submitting to Architect for review.
  11. Submit final shop drawings to membrane manufacturer prior to inspection and warranty.
- D. Sample for Initial Selection: For each exposed product, including TPO membrane and liquid flashings, of all colors available for selection.
- E. Samples for Verification: For the following products:

1. Sheet roofing, of color required.
  2. Walkway pads or rolls, of color required.
  - F. Qualification Data: For Installer and manufacturer.
  - G. Wind Uplift Resistance Submittal: For roofing system, indicating wind uplift requirements, signed by Manufacturer's technical engineer showing pressures and zones indicated.
  - H. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
    1. Submit evidence of compliance with performance requirements indicating Project specific requirements by roofing manufacturer.
  - I. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.
  - J. Research/Evaluation Reports: For components of roofing system, from ICC-ES.
  - K. Field quality-control reports.
  - L. Sample Warranties: For manufacturer's special warranties.
  - M. Maintenance Data: For roofing system to include in maintenance manuals.
- 1.7 QUALITY ASSURANCE
- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed and FM Global approved for roofing system identical to that used for this Project.
  - B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
  - B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
    1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
  - C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
  - D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.
- 1.9 FIELD CONDITIONS
- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
  - 1. Special warranty includes roofing membrane, base flashings, roofing membrane accessories, roof level rigid insulation, walkway products, and other components of roofing system.
  - 2. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Installer's Warranty: Submit roofing Installer's warranty, signed by Installer, covering Work of this Section.
  - 1. Include all components of roofing system such as roofing membrane, base flashing, fasteners, cover boards, walkway products, and other components of the roofing systems.
  - 2. Warranty Period: Two (2) years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
  - 1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
  - 2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D3746 or ASTM D4272.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7 and code required wind criteria for the Project's wind exposure classification.
- D. FM Global Listing: Roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a built-up roofing system, and shall be listed in FM Global's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
  - 1. Fire/Windstorm Classification: Class 1A-90.
  - 2. Hail-Resistance Rating: MH.
- E. Solar Reflective Index (SRI) greater than 78.
- F. Thermal Transmittance (U-Factor)/ Thermal Resistance (R-Value) Requirements: Provide adequate thickness of insulation to meet the following thermal transmittance/ thermal resistance requirements:
  - 1. For Exterior Roof Assemblies: Provide insulation such that assemblies meet U-Factor 0.033 (0.033 Btu/sq. ft. x h x deg F), equivalent to R-value 30.



- G. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

## 2.2 MANUFACTURERS

- A. Source Limitations: Obtain components including roof insulation and fasteners for roofing system and roofing components installed over the roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.
- B. Basis-of-Design Manufacturer: Firestone Building Products Co.; [www.firestonebpco.com](http://www.firestonebpco.com).
- C. Other Acceptable Manufacturer: Subject to compliance with requirements, provide TPO roofing systems by the following manufacturers:
  - 1. Carlisle SynTec Systems; [www.carlisesyntec.com](http://www.carlisesyntec.com).
  - 2. Johns Manville; [www.jm.com](http://www.jm.com).

## 2.3 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING, TPO-1

- A. Fabric-Reinforced TPO Sheet: ASTM D6878, internally fabric- or scrim-reinforced, uniform, flexible fabric-backed TPO sheet.
- B. TPO Sheet: ASTM D6878, internally fabric- or scrim-reinforced, self-adhering TPO sheet.
  - 1. Basis-of-Design Product: UltraPly TPO System by Firestone.
  - 2. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.
  - 3. Thickness: 60 mils, nominal.
  - 4. Exposed Face Color: Gray.

## 2.4 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
  - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.
- C. Round Penetration Flashing: Manufacturer's standard split-pipe type. With stainless steel termination ring.
- D. Bonding Adhesive: Manufacturer's standard, water based.
- E. Slip Sheet: Manufacturer's standard, of thickness required for application.
- F. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- G. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.
- H. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing to substrate, and acceptable to roofing system manufacturer.
- I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

## 2.5 SUBSTRATE AND COVER BOARD

- A. Substrate Board: ASTM C1177, glass-mat, water-resistant gypsum substrate, 1/2 inch; provide Type X, 5/8 inch thick where fire resistance requirements are indicated.
- B. Cover Board, CB-1: ASTM C1177, Class A, glass-mat, water-resistant gypsum substrate, 1/2 inch thick, factory primed.
- C. Basis-of-Design Manufacturer: Firestone Building Products Co.
- D. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening substrate board to roof deck.

## 2.6 VAPOR RETARDER

- A. Self-Adhering-Sheet Vapor Retarder: ASTM D1970, polyethylene film laminated to layer of rubberized asphalt adhesive, minimum 40-mil total thickness; maximum permeance rating of 0.03 perm; cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor retarder manufacturer.
  - 1. Basis-of-Design Product: V-Force Vapor Barrier Membrane by Firestone Building Products Co.
  - 2. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

## 2.7 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by TPO roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Global-approved roof insulation.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
  - 1. Basis-of-Design Manufacturer: Firestone Building Products Co.
  - 2. R-Value: R-30 minimum, continuous.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.
  - 1. Basis-of-Design Manufacturer: Firestone Building Products Co.
  - 2. Provide taper to achieve 1/2 inch per 12 inches (1:24) to drain at crickets and where indicated.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

## 2.8 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.
- B. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
  - 1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.

## 2.9 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16 inch thick and acceptable to roofing system manufacturer.

1. Basis-of-Design Product: UltraPly TPO Walkway Pad by Firestone Building Products Co.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
  1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
  2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

#### 3.3 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

#### 3.4 VAPOR-RETARDER INSTALLATION

- A. Install vapor retarder prior to setting drain bodies and other roof-mounted construction.
  1. Coordinate installation of other construction penetrating roof membrane. Ensure vapor retarder continuity.
- B. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 and 6 inches, respectively.
  1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
  2. Seal laps by rolling.
- C. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

#### 3.5 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.

- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
  - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- G. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
  - 1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
- H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.
  - 1. Fasten cover boards according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
  - 2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

### 3.6 INSTALLATION OF SELF-ADHERING ROOF MEMBRANE

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roof membrane and allow to relax before installing.
- C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer.
  - 1. Stagger end laps.
- E. Fold roof membrane to expose half of sheet width's bottom surface.
  - 1. Remove release liner on exposed half of sheet.
  - 2. Roll roof membrane over substrate while avoiding wrinkles.
- F. Fold remaining half of roof membrane to expose bottom surface.
  - 1. Remove release liner on exposed half of sheet.
  - 2. Roll roof membrane over substrate while avoiding wrinkles.
- G. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
- H. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- I. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.
  - 1. Test lap edges with probe to verify seam weld continuity.
  - 2. Apply lap sealant to seal cut edges of roof membrane and flashing sheet.
  - 3. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.

4. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

- J. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

### 3.7 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
  1. At roof tie-offs, use split-pipe boot and extend to lowest height permitted by manufacturer, but not extending above overburden surfaces. Terminate and secure top of flashing. Apply liquid flashing extending to top of anchor post.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

### 3.8 LIQUID FLASHING INSTALLATION

- A. Apply liquid flashing following manufacturer's instructions at roofing penetrations where preformed pipe boots are not utilized and for penetrations with irregular shapes and where specified elsewhere.
- B. Prime surfaces as required.
- C. Apply liquid flashing around roof tie-off anchors, extending up vertical surface of height required by manufacturer.

### 3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.
- B. Owner will engage a qualified testing agency to perform one of the following tests:
  1. Electrical Capacitance/Impedance Testing: Testing agency shall survey entire roof area for entrapped water within roof assembly according to ASTM D7954.
    - a. Perform tests before overlying construction is placed.
    - b. After testing, repair leaks, repeat tests, and make further repairs until roofing and flashing installations are watertight.
      - 1) Cost of retesting is Contractor's responsibility.
    - c. Testing agency shall prepare survey report indicating locations of entrapped moisture, if any.
- C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.10 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

## SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following sheet metal flashing and trim:
  - 1. Formed copings.
  - 2. Manufactured reglets.
  - 3. Formed wall flashing and trim.
  - 4. Formed low-slope roof flashing and trim.
  - 5. Formed steep-slope roof flashing and trim.
  - 6. Roof drainage sheet metal fabrications and downspouts.
  - 7. Flashing at door and window openings.
  - 8. Formed overhead piping safety pans.
  - 9. Polymethyl-methacrylate (PMMA) gutter liner.
- B. Related Requirements:
  - 1. Section 07 25 00 "Weather Barriers" for self-adhered membrane flashing behind sheet metal flashings (F-5).
  - 2. Section 07 54 23 "Thermoplastic Polyolefin (TPO) Roofing" for TPO-coated flashings used in TPO roofing assemblies.
  - 3. Section 07 92 00 "Joint Sealants" for sealants used between sheet metal flashing and trim and other materials.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Fabricate and install roof edge flashing and copings capable of resisting the climatic and geographical wind velocity pressure and uplift forces.
- C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
  - 1. Identify material, thickness, weight, and finish for each item and location in Project.
  - 2. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches. Include the following:
    - a. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
    - b. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work. Include pattern of seams.
    - c. Details of termination points and assemblies, including fixed points.
    - d. Details of expansion joints and expansion-joint corners, including showing direction of expansion and contraction.
    - e. Details of edge conditions and counterflashings as applicable.
    - f. Details of special conditions.
    - g. Details of connections to adjoining work.
- C. Compatibility Letter and Chart:
  - 1. Provide a Compatibility Letter certifying physical and chemical compatibility of products in this section with all other dampproofing, waterproofing, weather barrier, roofing, self-adhered flashing and sealant products in the Project.
  - 2. Provide input from this work toward a single Compatibility Chart to be compiled by the General Contractor. Compatibility Chart shall indicate:
    - a. All dampproofing, waterproofing, weather barrier, roofing, self-adhered flashing and sealant products.
    - b. Which other products from this group they interface (are in contact with) in the Project.
    - c. The physical and chemical compatibility between those interfaced products.
- D. Samples for Initial Selection: For each type of sheet metal flashing and trim indicated with factory-applied color finishes.
  - 1. Include similar Samples of trim and accessories involving color selection.

#### 1.5 QUALITY ASSURANCE

- A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
  - 1. Meet with Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
  - 2. Review methods and procedures related to sheet metal flashing and trim.
  - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.



4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

#### 1.7 COORDINATION

- A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
  1. Design Pressure: As indicated on Drawings.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

#### 2.2 SHEET METALS

- A. Provide sheet metal components and accessories as indicated in the Drawings.
- B. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- C. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
- D. Stainless-Steel Sheet: ASTM A240, or ASTM A666, Type 304, dead soft, fully annealed; with smooth, flat surface.
- E. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A653, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A792, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A755.
  1. Prepainted Finishes: Refer to Finishes articles below.

## 2.3 UNDERLAYMENT MATERIALS

- A. Underlayment Accessories: As indicated in SMACNA details:
1. Polyethylene Sheet: 6 mils thick polyethylene sheet complying with ASTM D4397.
  2. Felts: ASTM D226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
  3. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft.

## 2.4 FASTENERS

- A. General: Provide materials and types of fasteners and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
1. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
  2. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
  3. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
  4. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
  5. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
  6. Fasteners for Zinc-Tin Alloy-Coated Stainless-Steel Sheet: Series 300 stainless steel.
  7. Fasteners for Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A153 or ASTM F2329.

## 2.5 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Solder for Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
- C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- D. Elastomeric Sealant: ASTM C920, elastomeric polyurethane or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 16 mils (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- H. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.
- I. Polymethyl-Methacrylate (PMMA) Gutter Liner: Liquid-applied system providing a seamless waterproof membrane that conforms to penetrations and shapes. Provide manufacturer's recommended system components, including primers, cleaners, detailers, resins, scrims and topcoats. Provide the manufacturer's catalyzed acrylic resin primer, basecoat and topcoat, as

well as reinforcing scrim/ fleece layer. Ensure compatibility with roofing systems and other flashing components that may interface with the liner at installation.

1. Basis-of-Design Product: Liquid Applied Commercial Roofing Systems by Johns Manville; [www.jm.com](http://www.jm.com).

## 2.6 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions.
  1. Material: Stainless steel, 0.019 inch; Copper, 16 oz./sq. ft. thick; Aluminum, 0.024 inch thick; Galvanized steel, 0.022 inch thick.
  2. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
  3. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
  4. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
  5. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

## 2.7 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
- B. Fabricate metal flashing and trim using materials matching adjacent panels where exposed.
  1. Concealed Flashing: Where concealed from view, provide stainless steel.
  2. Counter Flashings: Match coping material and finish.
  3. Where exposed to view, match adjacent metal panel material and finish.
  4. Sills, at Grade: Aluminum, finish matching window system.
  5. Jambs and Head Flashings at Framed Openings: Aluminum, finish matching window system.
  6. Openings, Fiberglass: Coated steel, or aluminum. Material and finish to match adjacent metal wall panels.
- C. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
- D. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks, and true to line and levels indicated, with exposed edges folded back to form hems.
  1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
  2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

- E. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
- F. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
- G. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- H. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
  - 1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" for application but not less than thickness of metal being secured.

## 2.8 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot-long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch-high, end dams. Fabricate from the following materials:
  - 1. Stainless Steel: 0.0156 inch thick.
- B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:
  - 1. Prefinished metallic-coated steel: 0.028 inch thick.
- C. Wall Expansion-Joint Cover: Fabricate from the following materials:
  - 1. Prefinished metallic-coated steel: 0.028 inch thick.

## 2.9 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long sections. Furnish with 6-inch-wide, joint cover plates. Shop fabricated interior and exterior corners.
  - 1. Fabricate from the following materials:
    - a. Aluminum: 0.040 inch thick.
    - b. Prefinished metallic-coated steel: 0.028 inch thick.
- B. Copings: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricated interior and exterior corners.
  - 1. Fabricate from the following materials:
    - a. Prefinished metallic-coated steel: 0.028 inch thick.
- C. Base Flashing: Shop fabricated interior and exterior corners. Fabricate from the following materials:
  - 1. Stainless Steel: 0.0188 inch thick.
    - a. At concealed and flashing at sills in contact with ground or at grade.
  - 2. Prefinished metallic-coated steel: 0.028 inch thick.
- D. Counterflashing: Shop fabricated interior and exterior corners. Fabricate from the following materials:

1. Prefinished metallic-coated steel: 0.022 inch thick.
- E. Roof-Penetration Flashing: Fabricate from the following materials:
  1. Stainless Steel: 0.0188 inch thick.
    - a. Application: Where fully soldered assembly is required.
  2. Lead: 4 lb.
- F. Roof-Drain Flashing: Fabricate from the following materials:
  1. Stainless Steel: 0.0156 inch thick.
- 2.10 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS
  - A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:
    1. Prefinished metallic-coated steel: 0.028 inch thick.
  - B. Drip Edges: Fabricate from the following materials:
    1. Prefinished metallic-coated steel: 0.028 inch thick.
  - C. Eave and Rake Trim: Fabricate from the following materials:
    1. Prefinished metallic-coated steel: 0.028 inch thick.
- 2.11 ROOF-DRAINAGE SHEET METAL FABRICATIONS
  - A. Downspouts: Fabricate round and rectangular downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
    1. Hanger Style: As indicated or as selected by Architect.
    2. Fabricate from the following materials:
      - a. Prefinished metallic-coated steel: 0.028 inch thick.
- 2.12 FINISHES
  - A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - B. Steel Panels and Accessories:
    1. General: AAMA 621. Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both 0.2 mil (5 micron) primer and 0.8 mil (20 micron) color topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      - a. Approved PVDF Resin Products:
        - 1) Hylar 5000 by Solvay; [www.solvay.com](http://www.solvay.com).
        - 2) Kynar 500 by Arkema; [www.kynar500.com](http://www.kynar500.com).
      - b. Basis-of-Design Fluoropolymer Coating Products: Fluoropon Classic Coil Coating by Valspar Corp., div. of The Sherwin-Williams Co.; [www.valsparcoilextrusion.com](http://www.valsparcoilextrusion.com).
      - c. Other Approved Fluoropolymer Coating Products: Duranar XL Coil Coating by PPG IdeaScapes; [www.ppgideasclapes.com](http://www.ppgideasclapes.com).
    2. Exposed Finish: Two-coat fluoropolymer (PVDF) finish.
      - a. Colors: Match the color of the adjacent finish, as approved by Architect.

3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.
  1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
  2. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  1. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
  1. Coat side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
  2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
  3. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
- C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric or butyl sealant.
- E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
- F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric or butyl sealant concealed within joints.

- G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4-inch for wood screws.
  - 1. Galvanized or Prepainted, Metallic-Coated Steel: Use stainless-steel fasteners.
  - 2. Aluminum: Use aluminum or stainless-steel fasteners.
  - 3. Stainless Steel: Use stainless-steel fasteners.
- H. Seal joints with elastomeric or butyl sealant as required for watertight construction.
  - 1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
  - 2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."
- I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Prein edges of sheets to be soldered to a width of 1-1/2 inches except where pretinned surface would show in finished Work.
  - 1. Do not solder prepainted, metallic-coated steel and aluminum sheet.
  - 2. Stainless-Steel Soldering: Prein edges of uncoated sheets to be soldered using solder recommended for stainless steel and phosphoric acid flux. Promptly wash off acid flux residue from metal after soldering.
  - 3. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.
- J. Aluminum Flashing: Rivet or weld joints in uncoated aluminum where necessary for strength.

### 3.3 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Splash Pans: Install where downspouts discharge on low-sloped roofs. Set in asphalt roofing cement or elastomeric sealant compatible with roofing membrane.

### 3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal roof flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations for specified wind zone and as indicated.
- C. Copings: Anchor to resist uplift and outward forces for specified wind zone and as indicated.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric or butyl sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric or butyl sealant.

1. Secure in a waterproof manner.
- F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:
  1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
  2. Seal with elastomeric or butyl sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

### 3.5 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Openings Flashing in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

### 3.6 MISCELLANEOUS FLASHING INSTALLATION

- A. Overhead-Piping Safety Pans: Suspend pans from pipe and install drain line to plumbing waste or drain line.
- B. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric or butyl sealant to equipment support member.

### 3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION



## SECTION 07 92 00 - JOINT SEALANTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Silicone joint sealants.
  - 2. Nonstaining silicone joint sealants.
  - 3. Urethane joint sealants.
  - 4. Immersible joint sealants.
  - 5. Silyl-terminated polyether joint sealants.
  - 6. Mildew-resistant joint sealants.
  - 7. Butyl joint sealants.
  - 8. Latex joint sealants.
- B. Related Requirements:
  - 1. Section 09 29 00 "Gypsum Board" for acoustical joint sealant in sound-rated construction.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Compatibility Letter and Chart:
  - 1. Provide a Compatibility Letter certifying physical and chemical compatibility of products in this section with all other dampproofing, waterproofing, weather barrier, roofing, self-adhered flashing and sealant products in the Project.
  - 2. Provide input from this work toward a single Compatibility Chart to be compiled by the General Contractor. Compatibility Chart shall indicate:
    - a. All dampproofing, waterproofing, weather barrier, roofing, self-adhered flashing and sealant products.
    - b. Which other products from this group they interface (are in contact with) in the Project.
    - c. The physical and chemical compatibility between those interfaced products.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.

2. Joint-sealant manufacturer and product name.
  3. Joint-sealant formulation.
  4. Joint-sealant color.
  - E. Qualification Data: For qualified testing agency.
  - F. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.
  - G. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
    1. Joint-sealant location and designation.
    2. Manufacturer and product name.
    3. Type of substrate material.
    4. Proposed test.
    5. Number of samples required.
  - H. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
    1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
    2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
  - I. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
  - J. Sample Warranties: For special warranties.
- 1.5 QUALITY ASSURANCE
- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
  - B. Product Testing: Test joint sealants using a qualified testing agency.
    1. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.
  - C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
    1. Protect accepted mockups from the elements with weather-resistant membrane.
    2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
    3. Mockup Testing: Assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.

## 1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
  3. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with stone substrates.
  4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
  5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
  7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
  2. Conduct field tests for each kind of sealant and joint substrate.
  3. Notify Architect seven days in advance of dates and times when test joints will be erected.
  4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
    - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
      - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
  5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
  6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

## 1.7 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg.
  2. When joint substrates are wet.

3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## 1.8 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  1. Warranty Period: Two (2) years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  1. Warranty Period: Five (5) years from date of Substantial Completion for acrylic latex sealants.
  2. Warranty Period: 10 years from date of Substantial Completion for polyurethane sealants.
  3. Warranty Period: 10 years from date of Substantial Completion for silyl-terminated-poly-ether (STPe) sealants.
  4. Warranty Period: 20 years from date of Substantial Completion silicone sealants.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
  1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
  2. Disintegration of joint substrates from causes exceeding design specifications.
  3. Mechanical damage caused by individuals, tools, or other outside agents.
  4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

### 2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As indicated or as selected by Architect from manufacturer's full range.

### 2.2 MANUFACTURERS

- A. Approved Manufacturers:
  1. BASF Corp.; [www.master-builders-solutions.basf.us](http://www.master-builders-solutions.basf.us).
  2. Dow Corp.; [www.dow.com](http://www.dow.com).
  3. GE Construction Sealants; [www.siliconeforbuilding.com](http://www.siliconeforbuilding.com).
  4. Pecora Corp.; [www.pecora.com](http://www.pecora.com).
  5. Sika Corp.; [www.sika.com](http://www.sika.com).

6. Tremco, Inc.; [www.tremcosealants.com](http://www.tremcosealants.com).

## 2.3 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
  1. Basis-of-Design Product: Spectrem 1 by Tremco, Inc.
  2. Other Approved Products:
    - a. Dowsil 790 Silicone Building Sealant by Dow Corp.
    - b. Pecora 890 NST by Pecora Corp.
  3. Applications: Non-porous dissimilar exterior materials, as indicated in Drawings.
- B. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
  1. Basis-of-Design Product: Dowsil 756 SMS Building Sealant by Dow Corp.
  2. Other Approved Product: Pecora AVB by Pecora Corp.
  3. Applications: Above-grade expansion and control joints, as indicated in Drawings.
- C. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
  1. Basis-of-Design Products: Dowsil 758 Silicone Building Sealant by Dow Corp.
  2. Other Approved Product: Pecora AVB by Pecora Corp.
  3. Applications: Weather barrier to flashings, above-grade joints, as indicated in Drawings.
- D. Silicone, S, P, 100/50, T, NT: Single-component, pourable, plus 100 percent and minus 50 percent movement capability traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade P, Class 100/50, Uses T and NT.
  1. Basis-of-Design Product: Spectrem 900SL by Tremco, Inc.
  2. Other Approved Product: Pecora 301 SL by Pecora Corp.
  3. Applications: Horizontal joints, As indicated in Drawings.
- E. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.
  1. Basis-of-Design Product: Sikasil GP by Sika Corp.
  2. Applications: Porous exterior materials, as indicated in Drawings.

## 2.4 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C1248.
- B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
  1. Basis-of-Design Product: Spectrem 1 by Tremco, Inc.
  2. Other Approved Products:

- a. Dowsil 790 Silicone Building Sealant by Dow Corp.
  - b. Pecora 890 NST by Pecora Corp.
3. Applications: As indicated in Drawings.
- C. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
  1. Basis-of-Design Product: Spectrem 3 by Tremco, Inc.
  2. Other Approved Products:
    - a. Dowsil 795 Silicone Building Sealant by Dow Corp.
    - b. Pecora 895 NST by Pecora Corp.
  3. Applications: At expansion and control joints, precast concrete panel joints, perimeter caulking, and aluminum.
- D. Silicone, Nonstaining, M, NS, 50, NT: Nonstaining, multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type M, Grade NS, Class 50, Use NT.
  1. Basis-of-Design Product: Spectrem 4TS by Tremco, Inc.
  2. Applications: As indicated in Drawings.

## 2.5 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Uses T and NT.
  1. Basis-of-Design Product: Dymonic FC by Tremco, Inc.
  2. Other Approved Manufacturer: BASF Corp.
  3. Applications: As indicated in Drawings.
- B. Urethane, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.
  1. Basis-of-Design Product: Dymonic 100 by Tremco, Inc.
  2. Other Approved Manufacturer: Sika Corp.
  3. Applications: At expansion and control joints, precast concrete panel joints, perimeter caulking, and aluminum, as indicated in Drawings.
- C. Urethane, M, NS, 50, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 50, Use NT.
  1. Basis-of-Design Product: Dymeric 240FC by Tremco, Inc.
  2. Other Approved Product: Pecora DynaTrol II by Pecora Corp.
  3. Applications: Exterior paintable surfaces and exterior and interior horizontal concrete joints, as indicated in Drawings.
- D. Urethane, M, NS, 25, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 25, Use NT.
  1. Basis-of-Design Product: THC-901 by Tremco, Inc.

2. Other Approved Product: Pecora Dynatred by Pecora Corp.
3. Applications: General, and as indicated in Drawings.
- E. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 50, Uses T and NT.
  1. Basis-of-Design Manufacturer: LymTal International Inc.; [www.lymtal.com](http://www.lymtal.com).
  2. Applications: Exterior paintable surfaces and exterior and interior horizontal concrete joints.
- F. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 25, Uses T and NT.
  1. Basis-of-Design Product: Pecora Dynatrol II SG by Pecora Corp.
  2. Applications: As indicated in Drawings.

## 2.6 IMMERSIBLE JOINT SEALANTS

- A. Immersible Joint Sealants. Suitable for immersion in liquids; ASTM C1247, Class 2; tested in deionized water unless otherwise indicated.
- B. Urethane, Immersible, S, NS, 100/50, NT, I: Immersible, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses NT, and I.
  1. Basis-of-Design Product: Vulkem 45 SSL by Tremco, Inc.
  2. Applications: As indicated in Drawings.
- C. Urethane, Immersible, S, NS, 50, T, NT, I: Immersible, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 50, Uses T, NT, and I.
  1. Basis-of-Design Product: Dymonic 100 by Tremco, Inc.
  2. Applications: As indicated in Drawings.

## 2.7 SILYL-TERMINATED POLYETHER (STPE) JOINT SEALANTS

- A. STPE, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
  1. Basis-of-Design Product: Pecora Dynatrol I-XL Hybrid by Pecora Corp.
  2. Applications: As indicated in Drawings.
- B. STPE, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, silyl-terminated polyether joint sealant; ASTM C920, Type S, Grade NS, Class 100, Uses T and NT.
  1. Basis-of-Design Product: MasterSeal NP 150 Sealant or NP 150 Tint Base Sealant by Master Builders Solutions, formerly BASF.
  2. Applications: Where exterior, paintable sealant is required.

## 2.8 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
  - 1. Basis-of-Design Product: Tremsil 200by Tremco, Inc.
  - 2. Other Approved Manufacturers:
    - a. Dowsil 786 Silicone Sealant by Dow Corp.
    - b. GE Construction Sealants.
    - c. Sika Corp.
  - 3. Applications: At joints in ceramic tile walls and floor, around equipment and around plumbing fixtures, as indicated in Drawings.

## 2.9 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.
  - 1. Basis of Design Product: Tremco Butyl by Tremco, Inc.
  - 2. Other Approved Product: Pecora BC-158 by Pecora Corp.
  - 3. Applications: As indicated in Drawings.
- B. Single-component, non-hardening, non-sag, paintable synthetic rubber-tested to reduce airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing of similar assemblies according to ASTM E 90.
  - 1. Basis of Design Product: Acoustical/Curtainwall Sealant by Tremco, Inc.
  - 2. Other Approved Product: Pecora AC-20 FTR by Pecora Corp.
  - 3. Applications: At curtainwall joints, metal panel joining, bedding thresholds, secondary glazing seals, and areas where a seal is required against TPO gaskets, as indicated in Drawings.

## 2.10 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
  - 1. Basis-of-Design Product: Tremflex 834 by Tremco, Inc.
  - 2. Other Approved Product: Pecora AC-20 +Silicone by Pecora Corp.
  - 3. Applications: At interior door frames to walls, as indicated in Drawings.

## 2.11 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.



2.12 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Stone.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.
    - b. Glass.
    - c. Porcelain enamel.
    - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
  - 4. Ensure complete sealing and closure of all joints, openings, gaps, and cracks in exterior envelope.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.
  - 4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C1193.
  - 5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C1193.
    - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

### 3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
  - 1. Extent of Testing: Test completed and cured sealant joints as follows:

- a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
      - b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
    2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
      - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
    3. Inspect tested joints and report on the following:
      - a. Whether sealants filled joint cavities and are free of voids.
      - b. Whether sealant dimensions and configurations comply with specified requirements.
      - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
    4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
    5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
  - B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.
- 3.5 CLEANING
- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- 3.6 PROTECTION
- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

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## SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes:
  - 1. Hollow-metal doors (HM-1).
  - 2. Hollow-metal frames (HM).
- B. Related Requirements:
  - 1. Section 08 14 16 "Flush Wood Doors" for coordination with frames.
  - 2. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

#### 1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

#### 1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

#### 1.5 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.
- B. Shop Drawings: Include the following:
  - 1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  - 2. Locations of reinforcement and preparations for hardware.
  - 3. Details of each different wall opening condition.
  - 4. Details of anchorages, joints, field splices, and connections.
  - 5. Details of accessories.
  - 6. Details of moldings, removable stops, and glazing.
  - 7. Details of conduit and preparations for power, signal, and control systems.
- C. Samples for Verification:
  - 1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.

2. Prepare Samples approximately 8 by 10 inches to demonstrate compliance with requirements for quality of materials and construction:
    - a. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.
  - D. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.
  - E. Product Test Reports: For each type of hollow-metal frame, for tests performed by a qualified testing agency.
  - F. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
    1. Provide additional protection to prevent damage to factory-finished units.
  - B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
  - C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.
- B. Approved Manufacturers:
  1. Ceco brand associated with AADG, Inc., an ASSA ABLOY Group company; [www.cecodoor.com](http://www.cecodoor.com).
  2. Curries brand associated with AADG, Inc., an ASSA ABLOY Group company; [www.curries.com](http://www.curries.com).
  3. Steelcraft a division of Allegion plc; [www.steelcraft.com](http://www.steelcraft.com).

### 2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
  1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

## 2.3 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Doors:
  - 1. Type: As indicated in the Door Schedule.
  - 2. Thickness: 1-3/4 inches.
  - 3. Face: Uncoated steel sheet, minimum thickness of nominal 20-gauge, 0.032 inch.
  - 4. Edge Construction: Model 2, Seamless.
  - 5. Edge Bevel: Provide manufacturer's standard beveled or square edges.
  - 6. Non-Rated Core: Manufacturer's standard Kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate or vertical steel stiffener.
  - 7. Fire-Rated Core: Manufacturer's standard laminated mineral board core for fire-rated and temperature-rise-rated doors, where indicated in Door and Frame Schedule.
  - 8. Exposed Finish: Factory primed for field-finishing.
- C. Standard-Duty Frames: SDI A250.8, Level 1. At interior locations as scheduled.
  - 1. Type: As indicated in the Door Schedule.
  - 2. Physical Performance: Level C according to SDI A250.4.
  - 3. Frames:
    - a. Materials: Uncoated, cold-rolled steel sheet, minimum thickness of 18-gauge, 0.042 inch.
    - b. Construction: Fully welded.
  - 4. Exposed Finish: Factory primed for field-finishing.

## 2.4 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
  - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
  - 3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
  - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
  - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

## 2.5 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008, Commercial Steel (CS), Type B; suitable for exposed applications.

- B. Hot-Rolled Steel Sheet: ASTM A1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A653, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A879, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
  - 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008 or ASTM A1011, hot-dip galvanized according to ASTM A153, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Grout: ASTM C476, except with a maximum slump of 4 inches, as measured according to ASTM C143.
- H. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.
- I. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.6 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
  - 1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
  - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  - 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
  - 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
  - 5. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
      - 1) Two anchors per jamb up to 60 inches high.



- 2) Three anchors per jamb from 60 to 90 inches high.
      - 3) Four anchors per jamb from 90 to 120 inches high.
      - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
    - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Three anchors per jamb up to 60 inches high.
      - 2) Four anchors per jamb from 60 to 90 inches high.
      - 3) Five anchors per jamb from 90 to 96 inches high.
      - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
    - c. Compression Type: Not less than two anchors in each frame.
    - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
  6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
  7. Terminated Stops: Terminate stops 6 inches above finish floor with a 45-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
  - D. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
    1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
    2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
  - E. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
  - F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
    1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
    2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
    3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
    4. Provide loose stops and moldings on inside of hollow-metal work.
    5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
- 2.7 KICKPLATE
- A. Refer to section 08 71 00 "Door Hardware" for coordination of selected kickplate.

## 2.8 LOUVERS

- A. Provide louvers for doors, where indicated, which comply with SDI 111, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch- thick steel frame.
- B. Form corners of moldings with hairline joints. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

## 2.9 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

### 3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
  - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. At fire-rated openings, install frames according to NFPA 80.
    - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - c. Install frames with removable stops located on secure side of opening.
    - d. Install door silencers in frames before grouting.
    - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
  - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
4. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
5. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
  - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
  - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
  1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
  2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
  3. Smoke-Control Doors: Install doors according to NFPA 105.

### 3.4 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
  1. Fire-Rated Door Inspections: Inspect each fire-rated door according to NFPA 80, Section 5.2.
  2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements according to NFPA 101, Section 7.2.1.15.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

### 3.5 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.

- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

## SECTION 08 14 16 - FLUSH WOOD DOORS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Solid-core doors (WD).
  - 2. Flush wood doors (WD-1 and WD-2).
  - 3. Existing doors to remain (WD-3).
- B. Related Requirements:
  - 1. Section 08 11 13 "Hollow Metal Frames".
  - 2. Section 08 71 00 "Door Hardware".

#### 1.3 SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
  - 1. Dimensions and locations of blocking.
  - 2. Dimensions and locations of mortises and holes for hardware.
  - 3. Dimensions and locations of cutouts.
  - 4. Undercuts.
  - 5. Requirements for veneer matching.
  - 6. Doors to be factory finished and finish requirements.
  - 7. Fire-protection ratings for fire-rated doors.
- C. Samples for Verification: Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.

#### 1.4 QUALITY ASSURANCE

- A. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
- B. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
  - 1. Test Pressure: After five minutes into the test, the neutral pressure level in furnace shall be established at or less above the sill.

2. Oversize, Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide oversize fire door label or certificate of inspection, from a testing and inspecting agency acceptable to authorities having jurisdiction, stating that doors comply with requirements of design, materials, and construction.
3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 250 deg C maximum in 30 minutes of fire exposure.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

#### 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.
- B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during remainder of construction period.

### PART 2 - PRODUCTS

#### 2.1 FLUSH WOOD DOORS, GENERAL

- A. All Composite Wood products shall be made using ultra-low-emitting formaldehyde (ULEF) resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" (CARB Phase II) or shall be made with no added formaldehyde (NAF).
- B. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards.
- C. WDMA I.S.1-A Performance Grade: Standard duty.
- D. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
  1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
  2. Temperature-Rise Limit: Where indicated, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
  3. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
  4. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.

5. Pairs where astragals are not indicated or acceptable: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
6. Pairs where astragals are acceptable: Provide formed-steel edges and astragals with intumescent seals.
  - a. Finish steel edges and astragals with baked enamel, same color as doors.
  - b. Finish steel edges and astragals to match door hardware (locksets or exit devices).
- E. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
- F. Structural-Composite-Lumber-Core Doors:
  1. Structural Composite Lumber: WDMA I.S.10.
    - a. Screw Withdrawal, Face: 700 lbf.
    - b. Screw Withdrawal, Edge: 400 lbf.
- G. Sound Rating: Provide sound door slabs identical to those of assemblies tested as sound-retardant units by an acoustical testing agency, and have the following minimum rating:
  1. STC Rating: 49 as calculated by ASTM E413 when tested in an operable condition according to ASTM E90.

## 2.2 SOLID-CORE DOORS

- A. Fire-Rated Doors: Provide fire-rating as scheduled.
  1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
  2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as needed to eliminate through-bolting hardware.
  3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile matching face veneer, and laminated backing at hinge stiles for improved screw-holding capability and split resistance.
- B. Interior Doors, WD:
  1. Species: As selected by Architect.
  2. Grade: Premium Grade AA.
  3. Finish: Clear.
  4. Core: Either glued or nonglued block or structural composite lumber.
  5. Application: As indicated on Drawings.
- C. Interior Doors for Clear Finish, WD-1 and WD-2:
  1. Architectural Woodwork Standards Grade: Custom.
  2. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty.
  3. Cut and Species:
    - a. WD-1: Plain-Sawn, White Oak (*Quercus alba*).
    - b. WD-2: Plain-Sawn, Maple (*Acer*).

4. Faces for Interior Doors: Any AWI listed closed-grain hardwood of mill option, hardboard or MDO.
    - a. Apply MDO to standard-thickness, closed-grain, hardwood face veneers or directly to high-density hardboard crossbands.
    - b. Hardboard Faces: ANSI A135.4, Class 1 (tempered) or Class 2 (standard).
  5. Exposed Vertical and Top Edges: Any closed-grain hardwood of mill option.
  6. Core: Either glued or nonglued block or WDMA I.S. 10 structural composite lumber.
  7. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.
  8. Construction: Five plies, hot-pressed, bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.
  9. Frames, at Prehung Units: Any closed-grain hardwood of mill option; manufacturer's standard for product selected by Architect.
  10. Finish - Factory Primed:
    - a. WD-1: Clear.
    - b. WD-2: Clear.
  11. Applications:
    - a. WD-1: Provide at Sumner Hall as indicated in Door schedule.
    - b. WD-2: Provide at Coaledo Hall as indicated in Door schedule.
- D. Existing Interior Doors to Remain, WD-3:
1. Species: To match existing.
  2. Grade: To match existing.
  3. Finish: Clear.
  4. Core: To match existing.
  5. Application: Provide removal and refinish with clear coat at Sumner Hall.

## 2.3 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
1. Comply with NFPA 80 requirements for fire-rated doors.

## 2.4 FINISHES

- A. Finish wood doors with transparent finishes at woodworking shop finish faces and all four edges of doors, including mortises and cutouts. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Transparent Finish:
1. Grade: Premium.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.



1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  2. Reject doors with defects.
  - B. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.2 INSTALLATION
- A. Hardware: For installation, refer to Section 08 71 00 "Door Hardware."
  - B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
    1. Install fire-rated doors according to NFPA 80.
  - C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
    1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
      - a. Comply with NFPA 80 for fire-rated doors.
    2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
  - D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
  - E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.
- 3.3 ADJUSTING
- A. Operation: Rehang or replace doors that do not swing or operate freely.
  - B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

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## SECTION 08 31 13 - ACCESS DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Wall access doors and frames (AP-1, AP-2 and AP-3).
  - 2. Ceiling access doors and frames.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of door and frame indicated. Include construction details relative to materials, individual components and profiles, finishes, and fire ratings (if required) for access doors and frames.
- B. Schedule: Provide complete door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.
- C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:
  - 1. Method of attaching door frames to surrounding construction.
  - 2. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim.

#### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain doors and frames through one source from a single manufacturer.
- B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are labeled and listed by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction:
  - 1. NFPA 252 or UL 10B for vertical access doors.
  - 2. ASTM E 119 or UL 263 for horizontal access doors and frames.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- B. Hot-Rolled Steel Sheets: ASTM A569/A569M, Commercial Steel (CS), Type B; free of scale, pitting, and surface defects; pickled and oiled; with minimum thickness indicated representing specified nominal thickness according to ASTM A568/A568M.
- C. Cold-Rolled Steel Sheets: ASTM A366/A366M, Commercial Steel (CS), or ASTM A620/A620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified nominal thickness according to ASTM A568/A568M. Electrolytic

zinc-coated steel sheet, complying with ASTM A591/A591M, Class C coating, may be substituted at fabricator's option.

- D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666, Type 316; with minimum sheet thickness indicated representing specified thickness according to ASTM A480/A480M.
- E. Drywall Beads: Edge trim formed from 0.03-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.
- F. Plaster Bead: Casing bead formed from 0.03-inch zinc-coated steel sheet with flange formed out of expanded metal lath and in size to suit thickness of plaster.

## 2.2 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- B. Shop Primer for Metallic-Coated Steel: Organic zinc-rich primer complying with SSPC-Paint 20 and compatible with topcoat.

## 2.3 ACCESS DOORS AND FRAMES

- A. Flush, Insulated, Fire-Rated Access Doors and Frames with Exposed Trim: Fabricated from stainless-steel sheet.
  - 1. Locations: Ceramic-tile wall surfaces.
  - 2. Fire-Resistance Rating: One or one and a half hours as noted.
  - 3. Temperature Rise Rating: 282 deg F at the end of 30 minutes.
  - 4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.035 inch.
  - 5. Frame: Minimum 1/16-inch-thick sheet metal with 1-inch-wide, surface-mounted trim.
  - 6. Hinges: Concealed pin type.
  - 7. Automatic Closer: Spring type.
  - 8. Latch: Self-latching bolt operated by key with interior release.
  - 9. Lock: Key-operated cylinder lock, with interior release.
    - a. Basis-of-Design Manufacturer: Best, div. of Dormakaba Group; [www.bestaccess.com](http://www.bestaccess.com).
  - 10. Finish: No. 4 directional polish.
- B. Flush, Insulated, Fire-Rated Access Doors and Trimless Frames: Fabricated from steel sheet.
- C. Basis-of-Design Products:
  - 1. AP-1: Bauco Plus II by Bauco Access Panel Solutions, Inc.; [www.accesspanelsolutions.com](http://www.accesspanelsolutions.com).
    - a. Size: 24 x 24 inches.
  - 2. AP-2 and AP-3: Fire Rated Wall Access Door from FR Series by Elmdor Stoneman; [www.elmdorstoneman.com](http://www.elmdorstoneman.com).
    - a. Sizes:
      - 1) AP-2: 24 x 24 inches.
      - 2) AP-3: 24 x 36 inches.

3. Locations: Gypsum board wall and ceiling surfaces.
  4. Fire-Resistance Rating: One or one and a half hours as noted.
  5. Temperature Rise Rating: 282 deg F at the end of 30 minutes.
  6. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.035 inches.
  7. Frame: Minimum 1/16-inch-thick sheet metal with drywall bead.
  8. Hinges: Concealed pin type.
  9. Automatic Closer: Spring type.
  10. Latch: Self-latching bolt operated by mortise cylinder lock, with interior release.
  11. Lock: Key-operated cylinder lock with interior release.
    - a. Basis-of-Design Manufacturer: Best, div. of Dormakaba Group; [www.bestaccess.com](http://www.bestaccess.com).
  12. Finish: Primed for field painting, match adjacent walls or ceiling as approved by Architect.
- D. Recessed Access Doors and Trimless Frames: Fabricated from metallic-coated steel or stainless-steel sheet.
1. Locations: Gypsum board and acoustical-tile wall and ceiling surfaces.
  2. Door: Minimum 1/16-inch-thick sheet metal in the form of a pan recessed 5/8 inch for gypsum board acoustical-tile infill.
  3. Frame: Minimum 1/16-inch-thick sheet metal with only frame edge exposed in acoustical ceiling surfaces.
  4. Hinges: Concealed pivoting rod hinge.
  5. Lock: Key-operated cylinder lock.
    - a. Basis-of-Design Manufacturer: Best, div. of Dormakaba Group; [www.bestaccess.com](http://www.bestaccess.com).
  6. Finish: Primed for field painting, match adjacent walls or ceiling as approved by Architect.
  7. Size: 12 inch x 12 inch, 16 inch x 16 inch, 30 inch x 30 inch and as indicated.

## 2.4 SCHEDULE

- A. Owner Standards: Provide access doors and frames as follows:
1. Provide wall access doors and frames of no less than 24 x 24 inches in size where access to the equipment or device is less than 18 inches from the finished ceiling; provide larger size where equipment or device size or maintenance needs require a larger access opening.
  2. Provide wall access doors and frames of 8 x 8 inches in size where access to the equipment or device is more than 18 inches from the finished ceiling; provide larger size where equipment or device size or maintenance needs require a larger access opening.
  3. Provide ceiling access doors and frames of no less than 24 x 24 inches in size; provide larger size where equipment or device size or maintenance needs require a larger access opening.
  4. Final location and size of access panels shall be reviewed and approved during an on-site review by OSU Project Manager, EH&S construction safety officer, and applicable Shop prior to framing block-out and installation of access doors and frames.

## 2.5 FABRICATION

- A. General: Provide access door assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
  - 1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
  - 2. For trimless frames with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
- D. Provide stainless steel access doors and frame assemblies at ceramic tile wall locations.

## 2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

## 2.7 STEEL FINISHES

- A. Surface Preparation: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
  - 1. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- B. Apply shop primer to uncoated surfaces of metal fabrications. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

## 2.8 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Bright, Directional Polish: No. 4 finish.
  - 1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

### 3.2 INSTALLATION

- A. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- B. Install recessed finish material.

3.3 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

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## SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

### 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. Aluminum-framed storefront system (SF-1).
  - 2. Aluminum-framed entrance doors.
  - 3. Interior aluminum-framed partitions (SF-2).
  - 4. Insulated metal panels (IMP-1).
  - 5. Delegated design.
- B. Related Requirements:
  - 1. Section 01 61 16 "Delegated Design Requirements" for delegated design for deferred submittal.
  - 2. Section 07 62 00 "Sheet Metal Flashing and Trim."
  - 3. Section 07 92 00 "Joint Sealants."
  - 4. Section 08 71 00 "Door Hardware."
  - 5. Section 08 80 00 "Glazing."

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
  - 1. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
    - a. Joinery, including concealed welds.
    - b. Anchorage.
    - c. Expansion provisions.
    - d. Glazing.
    - e. Flashing and drainage.
  - 2. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
  - 3. Include point-to-point wiring diagrams showing the following:

- a. Power requirements for each electrically operated door hardware.
  - b. Location and types of switches, signal device, conduit sizes, and number and size of wires.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- F. Qualification Data: For Professional Engineer.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.
- B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C1401 recommendations for post-installation-phase quality-control program.

#### 1.6 QUALITY ASSURANCE

- A. Engineer Qualifications: Qualified professional engineer responsible for delegated design.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- C. Laboratory Mockup Testing Agency Qualifications: Qualified according to ASTM E699 for testing indicated.
- D. Testing Agency Qualifications: Qualified according to ASTM E699 for testing indicated and accredited by the International Accreditation Service or the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement as complying with ISO/IEC 17025.
- E. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
  - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

#### 1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures, including, but not limited to, excessive deflection.
    - b. Noise or vibration created by wind and thermal and structural movements.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - d. Water penetration through fixed glazing and framing areas.

- e. Failure of operating components.
- 2. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
    - b. Chalking more than a No. 8 rating when tested according to ASTM D4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
  - 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  - 2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
    - e. Failure of operating units.
- C. Structural Loads:
  - 1. Wind Loads: As indicated on Structural Drawings.
  - 2. Other Design Loads: As indicated on Structural Drawings.
  - 3. Deflection of Framing Members: At design wind pressure, as follows:
    - a. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
    - b. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.
      - 1) Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

- D. Test according to ASTM E330 as follows:
1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
  2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
  3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- E. Air Infiltration: Test according to ASTM E283 for infiltration as follows:
1. Entrance Doors:
    - a. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
    - b. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
    - c. Retain "Water Penetration under Static Pressure" Paragraph below for static-pressure method, which is most frequently specified. For water-penetration tests, AAMA 501 states that a static-air-pressure differential of 20 percent of wind-load design pressure provides satisfactory performance in most parts of the United States. Locations where high winds and heavy rains occur simultaneously require higher test-pressure differences. Both static and dynamic testing may be required or desired for certain designs, particularly those incorporating special water-drainage features, such as rain screen walls.
- F. Water Penetration under Static Pressure: Test according to ASTM E331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- G. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
  2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- H. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
- I. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas as a system shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
  2. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas as a system shall have SHGC of no greater than 0.35 as determined according to NFRC 200.
- J. Thermal Movements: Allow for thermal movements resulting from ambient and surface

temperature changes.

## 2.2 MANUFACTURERS

- A. Source Limitations: Obtain all components of storefront system, including framing, entrances and accessories, from single manufacturer.
- B. Basis-of-Design Manufacturer: Kawneer North America; [www.kawneer.com](http://www.kawneer.com).
- C. Other Approved Manufacturers:
  - 1. Arcadia Inc; [www.arcadiainc.com](http://www.arcadiainc.com).
  - 2. EFCO Corp; [www.efcocorp.com](http://www.efcocorp.com).
  - 3. Starline Windows; [www.starlinewindows.com](http://www.starlinewindows.com).
  - 4. Wausau; [www.wausauwindow.com](http://www.wausauwindow.com).

## 2.3 ALUMINUM-FRAMED STOREFRONT SYSTEMS

- A. Aluminum Storefront System and Entrance Doors:
  - 1. Basis-of-Design Product, SF-1:
    - a. Storefront System: Trifab VersaGlaze (VG) 451T Framing System (Thermal) by Kawneer.
    - b. Storefront Entrance Doors: Model 500, Non-Thermal Entrance Door by Kawneer.
- B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
  - 1. Framing: 2-inches wide by 4-1/2 inches deep framing members, captured offset glazed at head and sill, 2-sided structural silicone vertical joints and at corners, screw spline, shear block, or compensating stick for 1-inch thick insulating glass units.
  - 2. Construction: Thermally-broken.
  - 3. Glazing System: Retained mechanically with gaskets on two sides.
  - 4. Glazing Plane: Front plane.
  - 5. Finish: High-performance organic finish; refer to Finishes article below.
    - a. Color: As selected by Architect.
  - 6. Fabrication Method: Field-fabricated stick system.
- C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

## 2.4 INTERIOR ALUMINUM FRAMED STOREFRONTS

- A. Aluminum Storefront System and Entrance Doors:
  - 1. Basis-of-Design Product, SF-2: Trifab VersaGlaze (VG) 450 Framing System by Kawneer.
- B. Framing Members: Manufacturer's extruded aluminum framing members of thickness required and reinforced as required to support imposed loads.
  - 1. Framing: 1-3/4-inches wide by 4-1/2-inches deep framing members, screw spline, shear block, or compensating stick construction; for 1/4-inch or 3/8-inch thick glazing.
  - 2. Glazing System: Retained mechanically with gaskets on two sides.

3. Glazing Plane: Center plane.
4. Finish: High-performance organic finish; refer to Finishes article below.
  - a. Color: As selected by Architect.
5. Fabrication Method: Field-fabricated stick system.
- C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

## 2.5 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.
  1. Door Construction: 2- to 2-1/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated, and fillet welded or that incorporate concealed tie rods.
    - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
  2. Door Design: Narrow stile; 2-1/2-inch nominal width. Top Rail, 2-1/2 inches; Bottom Rail: 10 inches.
  3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
    - a. Provide nonremovable glazing stops on outside of door.

## 2.6 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 71 00 "Door Hardware."
- B. Cylinders: As specified in Section 08 71 00 "Door Hardware."
- C. Butt Hinges: BHMA A156.1, Grade 1, radius corner.
  1. Nonremovable Pins: Provide setscrew in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.
  2. Exterior Hinges: Stainless steel, with stainless-steel pin Nonferrous Insert material.
  3. Quantities:
    - a. For doors up to 87 inches high, provide three hinges per leaf.
    - b. For doors more than 87 and up to 120 inches high, provide four hinges per leaf.
- D. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.
- E. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- F. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- G. Operating Trim: BHMA A156.6.
- H. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as

required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.

- I. Concealed Overhead Holders and Stops: BHMA A156.8, Grade 1.
- J. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- K. Weather Stripping: Manufacturer's standard replaceable components.
  - 1. Compression Type: Made of ASTM D2000 molded neoprene or ASTM D2287 molded PVC.
  - 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- L. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- M. Thresholds: BHMA A156.21 raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.
- N. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

## 2.7 GLAZING

- A. Glazing: Refer to Section 08 80 00 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: Comply with Section 08 80 00 "Glazing."
- D. Structural Glazing Sealants: ASTM C1184 chemically curing silicone formulation that is compatible with system components with which it comes in contact; specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in storefront system indicated.
  - 1. Color: As selected by Architect from manufacturer's full range of colors.
- E. Weatherseal Sealants: ASTM C920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.
  - 1. Color: Match structural sealant.
- F.
- G.
- H.
- I.
- J.
- K.
- L.
- M.
  - 1.

2.8 INSULATED METAL PANELS:

- A. General: Provide factory-fabricated insulated metal spandrel panels.
  - 1. Basis-of-Design Panel Product: Formed Edge Infill Panels by Mapes Industries, Inc.; [www.mapes.com](http://www.mapes.com).
  - 2. Composition:
    - a. Face: 0.032-inch prefinished smooth aluminum; Class 1 color anodized.
      - 1) Color: Matching aluminum framing; refer to Aluminum Finishes articles in this Section.
    - b. Stabilizer Substrate: 3/16 in. tempered Hardboard.
    - c. Core: 2.0 lbs. density Polyisocyanurate foam; R value 6.0 per inch.
    - d. Stabilizer Substrate: 3/16 in. tempered Hardboard.
    - e. Core: 2.0 lbs. density Polyisocyanurate foam; R value 6.0 per inch.
    - f. Backing: Gypsum board; 5/8 in. fire resistive.
  - 3. Thickness: 1 inch (nominal).
  - 4. Tolerances:
    - a. Thickness: Plus or minus 1/16 inch.
    - b. Length / Width: Plus 0-inch, minus 1/8 inch.
    - c. Squareness: 1/64 inch per lineal foot.
  - 5. Performance: Surface Burning Characteristics, per ASTM E84: Panel shall have a Class A rating with a Flame Spread Index less than 25, and a Smoke Developed Index less than 450.
  - 6. Application: Provide factory-fabricated spandrel panels at locations where the spandrel panel is exposed to view at Coaledo Hall; or as indicated in Drawings.

2.9 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  - 1. Sheet and Plate: ASTM B209.
  - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
  - 3. Extruded Structural Pipe and Tubes: ASTM B429.
  - 4. Structural Profiles: ASTM B308.
- B. Steel Reinforcement:
  - 1. Structural Shapes, Plates, and Bars: ASTM A36.
  - 2. Cold-Rolled Sheet and Strip: ASTM A1008.
  - 3. Hot-Rolled Sheet and Strip: ASTM A1011.

2.10 ACCESSORIES

- A. Automatic Door Operators: Section 08 71 00 "Door Hardware".
- B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
  - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.



2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from 300 series stainless steel.
- C. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.
- E. Rigid PVC Filler.

## 2.11 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
  1. Profiles that are sharp, straight, and free of defects or deformations.
  2. Accurately fitted joints with ends coped or mitered.
  3. Physical and thermal isolation of glazing from framing members.
  4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  5. Provisions for field replacement of glazing from exterior interior for vision glass and exterior for spandrel glazing or metal panels.
  6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- F. Storefront Framing: Fabricate components for assembly using screw-spline system.
- G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
  1. At interior and exterior doors, provide compression weather stripping at fixed stops.
- H. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
  1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
  2. At exterior doors, provide weather sweeps applied to door bottoms.
- I. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.12 ALUMINUM FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for

recommendations for applying and designating finishes.

- B. Aluminum Finish: Provide high-performance organic finish.
  - 1. High-Performance Organic Finish: Two- or three- coat fluoropolymer finish complying with AAMA 2604 or AAMA 2605 and containing not less than 70 percent PVDF or FEVE resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    - a. Basis-of-Design Product: Permafluor Architectural Coating by Kawneer.
  - 2. Color: As selected by Architect from manufacturer's full range.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.13 SOURCE QUALITY CONTROL

- A. Structural Sealant: Perform quality-control procedures complying with ASTM C1401 recommendations, including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

### 3.3 INSTALLATION

- A. General:
  - 1. Comply with manufacturer's written instructions.
  - 2. Do not install damaged components.
  - 3. Fit joints to produce hairline joints free of burrs and distortion.
  - 4. Rigidly secure nonmovement joints.
  - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
  - 6. Seal perimeter and other joints watertight unless otherwise indicated.
- B. Metal Protection:
  - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
  - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

- C. Install components plumb and true in alignment with established lines and grades.
- D. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- E. Install glazing as specified in Section 08 80 00 "Glazing."
- F. Install weatherseal sealant according to Section 07 92 00 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
  - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
  - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

### 3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
  - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
  - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
  - 3. Alignment:
    - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
  - 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
  - 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
    - a. Perform a minimum of three tests in areas as directed by Architect.
- C. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
  - 1. Test a minimum of six areas on each building facade.
  - 2. Repair installation areas damaged by testing.
- D. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.6 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

3.7 ENTRANCE DOOR HARDWARE

- A. Refer to Section 08 71 00 "Door Hardware."

END OF SECTION

## SECTION 08 71 00 – DOOR HARDWARE

### 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. Mechanical and electrified door hardware
  - 2. Electronic access control system components
- B. Section excludes:
  - 1. Windows
  - 2. Cabinets (casework), including locks in cabinets
  - 3. Signage
  - 4. Toilet accessories
  - 5. Overhead doors
- C. Related Sections:
  - 1. Division 01 Section "Alternates" for alternates affecting this section.
  - 2. Division 06 Section "Rough Carpentry"
  - 3. Division 06 Section "Finish Carpentry"
  - 4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
  - 5. Division 08 Sections:
    - a. "Metal Doors and Frames"
    - b. "Flush Wood Doors"
    - c. "Stile and Rail Wood Doors"
    - d. "Interior Aluminum Doors and Frames"
    - e. "Aluminum-Framed Entrances and Storefronts"
    - f. "Stainless Steel Doors and Frames"
    - g. "Special Function Doors"
    - h. "Entrances"
  - 6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
  - 7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

#### 1.3 REFERENCES

- A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
  2. UL 10C - Positive Pressure Test of Fire Door Assemblies
  3. UL 1784 - Air Leakage Tests of Door Assemblies
  4. UL 305 - Panic Hardware
  - B. DHI - Door and Hardware Institute
    1. Sequence and Format for the Hardware Schedule
    2. Recommended Locations for Builders Hardware
    3. Keying Systems and Nomenclature
    4. Installation Guide for Doors and Hardware
  - C. NFPA – National Fire Protection Association
    1. NFPA 70 – National Electric Code
    2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
    3. NFPA 101 – Life Safety Code
    4. NFPA 105 – Smoke and Draft Control Door Assemblies
    5. NFPA 252 – Fire Tests of Door Assemblies
  - D. ANSI - American National Standards Institute
    1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
    2. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
    3. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
    4. ANSI/SDI A250.8 - Standard Steel Doors and Frames
- 1.4 SUBMITTALS
- A. General:
    1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
    2. Prior to forwarding submittal:
      - a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
      - b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
  - B. Action Submittals:
    1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
    2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
      - a. Wiring Diagrams: For power, signal, and control wiring and including:
        - 1) Details of interface of electrified door hardware and building safety and security systems.

- 2) Schematic diagram of systems that interface with electrified door hardware.
  - 3) Point-to-point wiring.
  - 4) Risers.
3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
  - a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
4. Door Hardware Schedule:
  - a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
  - b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
  - c. Indicate complete designations of each item required for each opening, include:
    - 1) Door Index: door number, heading number, and Architect's hardware set number.
    - 2) Quantity, type, style, function, size, and finish of each hardware item.
    - 3) Name and manufacturer of each item.
    - 4) Fastenings and other pertinent information.
    - 5) Location of each hardware set cross-referenced to indications on Drawings.
    - 6) Explanation of all abbreviations, symbols, and codes contained in schedule.
    - 7) Mounting locations for hardware.
    - 8) Door and frame sizes and materials.
    - 9) Degree of door swing and handing.
    - 10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.
5. Key Schedule:
  - a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
  - b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
  - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
  - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.

- e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
    - f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.
  - C. Informational Submittals:
    - 1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
    - 2. Provide Product Data:
      - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
      - b. Include warranties for specified door hardware.
  - D. Closeout Submittals:
    - 1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
      - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
      - b. Catalog pages for each product.
      - c. Final approved hardware schedule edited to reflect conditions as installed.
      - d. Final keying schedule
      - e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
      - f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
  - E. Inspection and Testing:
    - 1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
      - a. Fire door assemblies, in compliance with NFPA 80.
      - b. Required egress door assemblies, in compliance with NFPA 101.
- 1.5 QUALITY ASSURANCE
- A. Qualifications and Responsibilities:
    - 1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
    - 2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
    - 3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
      - a. For door hardware: DHI certified AHC or DHC.



- b. Can provide installation and technical data to Architect and other related subcontractors.
    - c. Can inspect and verify components are in working order upon completion of installation.
    - d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.
  - 4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
- B. Certifications:
  - 1. Fire-Rated Door Openings:
    - a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
    - b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
  - 2. Smoke and Draft Control Door Assemblies:
    - a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
    - b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
  - 3. Electrified Door Hardware
    - a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
  - 4. Accessibility Requirements:
    - a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.
- C. Pre-Installation Meetings
  - 1. Keying Conference
    - a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
      - 1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
      - 2) Preliminary key system schematic diagram.
      - 3) Requirements for key control system.
      - 4) Requirements for access control.
      - 5) Address for delivery of keys.
  - 2. Pre-installation Conference
    - a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

- b. Inspect and discuss preparatory work performed by other trades.
  - c. Inspect and discuss electrical roughing-in for electrified door hardware.
  - d. Review sequence of operation for each type of electrified door hardware.
  - e. Review required testing, inspecting, and certifying procedures.
  - f. Review questions or concerns related to proper installation and adjustment of door hardware.
3. Electrified Hardware Coordination Conference:
- a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
- C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
- D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

#### 1.7 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

#### 1.8 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
  - 1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
  - 2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
    - a. Mechanical Warranty

- 1) Locks
  - a) Schlage L Series: 3 years
  - b) Schlage ND Series: 10 years
- 2) Exit Devices
  - a) Von Duprin: 3 years
- 3) Closers
  - a) LCN 4000 Series: 30 years

#### 1.9 MAINTENANCE

- A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
- B. Turn over unused materials to Owner for maintenance purposes.

### PART 1 - PRODUCTS

#### 1.10 MANUFACTURERS

- A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."
  1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.
- B. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

#### 1.11 MATERIALS

- A. Fabrication
  1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
  2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
  3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
  - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
- C. Cable and Connectors:
  - 1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
  - 2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
  - 3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

#### 1.12 HINGES

- A. Manufacturers and Products:
  - 1. Scheduled Manufacturer and Product:
    - a. Ives 5BB series
  - 2. Acceptable Manufacturers and Products:
    - a. McKinney TB series
    - b. Best FBB series
- B. Requirements:
  - 1. Provide hinges conforming to ANSI/BHMA A156.1.
  - 2. Provide five knuckle, ball bearing hinges.
  - 3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
    - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
    - b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
  - 4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
    - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
    - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
  - 5. 2 inches or thicker doors:
    - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
    - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
  - 6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
  - 7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
  - 8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
    - a. Steel Hinges: Steel pins
    - b. Non-Ferrous Hinges: Stainless steel pins
    - c. Out-Swinging Exterior Doors: Non-removable pins
    - d. Out-Swinging Interior Lockable Doors: Non-removable pins

- e. Interior Non-lockable Doors: Non-rising pins
  - 9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.
- 1.13 PIVOT SETS
- A. Manufacturers:
    - 1. Scheduled Manufacturer:
      - a. Ives
    - 2. Acceptable Manufacturers:
      - a. Rixson
  - B. Requirements:
    - 1. Provide pivot sets complete with oil-impregnated top pivot, unless indicated otherwise.
    - 2. Where offset pivots are specified, Provide one intermediate pivot for doors less than 91 inches (2311 mm) high and one additional intermediate pivot per leaf for each additional 30 inches (762 mm) in height or fraction thereof. Intermediate pivots spaced equally not less than 25 inches (635 mm) or not more than 35 inches (889 mm) on center, for doors over 121 inches (3073 mm) high.
    - 3. Provide appropriate model where pivot sets are scheduled at fire rated openings.
    - 4. Provide pivots with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electrified pivot nearest to electrified locking component. If manufacturer of electrified locking component requires another device for power transfer, then provide recommended power transfer device and appropriate quantity of pivots.
    - 5. Provide mortar guard for each electric pivot specified, unless specified in hollow metal frame specification.
- 1.14 MORTISE LOCKS
- A. Manufacturers and Products:
    - 1. Scheduled Manufacturer and Product:
      - a. Schlage L9000 series
    - 2. Acceptable Manufacturers and Products:
      - a. No Substitute
  - B. Requirements:
    - 1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
    - 2. Indicators: Where specified, provide indicator window measuring a minimum 2-inch x 1/2 inch with 180-degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
    - 3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
    - 4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.

5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
7. Provide motor based electrified locksets that comply with the following requirements:
  - a. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
  - b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case.
  - c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
  - d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate “hot levers” in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
  - e. Connections – provide quick-connect Molex system standard.
8. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
  - a. Lever Design: <06A>.

1.15 CYLINDRICAL LOCKS – GRADE 1

- A. Manufacturers and Products:
  1. Scheduled Manufacturer and Product:
    - a. Schlage ND series
  2. Acceptable Manufacturers and Products:
    - a. No Substitute
- B. Requirements:
  1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
  2. Cylinders: Refer to "KEYING" article, herein.
  3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
  4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
  5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
  6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
  7. Provide electrified options as scheduled in the hardware sets.
  8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
    - a. Vandlgard: Provide levers with vandal resistant technology for use at heavy traffic or abusive applications.
    - b. Lever Design: <RHO>.

1.16 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Von Duprin 98/35A series
2. Acceptable Manufacturers and Products:
  - a. No Substitute

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

1.17 CYLINDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Schlage Everest
2. Acceptable Manufacturers and Products:

- a. No Substitute
  - B. Requirements:
    - 1. Provide cylinders/cores, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
    - 2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
    - 3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.
    - 4. Nickel silver bottom pins.
- 1.18 KEYING
- A. Scheduled System:
    - 1. Existing factory registered system:
      - a. Provide cylinders/cores keyed into Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
  - B. Requirements:
    - 1. Construction Keying:
      - a. Replaceable Construction Cores.
        - 1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
          - a) 3 construction control keys
          - b) 12 construction change (day) keys.
        - 2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.
    - 2. Permanent Keying:
      - a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
        - 1) Master Keying system as directed by the Owner.
      - b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
      - c. Provide keys with the following features:
        - 1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
        - 2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
      - d. Identification:
        - 1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
        - 2) Identification stamping provisions must be approved by the Architect and Owner.



- 3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
  - 4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
  - 5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
- e. Quantity: Furnish in the following quantities.
- 1) Change (Day) Keys: 3 per cylinder/core.
  - 2) Permanent Control Keys: 3.
  - 3) Master Keys: 6.

1.19 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. LCN 4010/4110/4020 series
2. Acceptable Manufacturers and Products:
  - a. No Substitute

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. Certify surface mounted mechanical closers to meet fifteen million (15,000,000) full load cycles. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within 6-inch (152 mm) top rail without use of mounting plate so that closer is not visible through vision panel from pull side.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).

10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

#### 1.20 DOOR TRIM

##### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Elmes
  - b. Trimco
  - c. Burns
  - d. Rockwood

##### B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

#### 1.21 PROTECTION PLATES

##### A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Burns
  - b. Trimco
  - c. Rockwood

##### B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

#### 1.22 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

##### A. Manufacturers:

1. Scheduled Manufacturers:
  - a. Glynn-Johnson
2. Acceptable Manufacturers:
  - a. Rixson
  - b. Sargent

##### B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
2. Provide friction type at doors without closer and positive type at doors with closer.

1.23 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Trimco
  - b. Burns
  - c. Rockwood

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button or thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

1.24 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:
  - a. Zero International
2. Acceptable Manufacturers:
  - a. National Guard
  - b. Reese
  - c. Legacy
  - d. Pemko

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

1.25 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:
    - a. Ives
  2. Acceptable Manufacturers:
    - a. Burns
    - b. Rockwood
    - c. Trimco
  - B. Requirements:
    1. Provide "push-in" type silencers for hollow metal or wood frames.
    2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
    3. Omit where gasketing is specified.
- 1.26 FINISHES
- A. FINISH: BHMA 626/652 (US26D); EXCEPT:
    1. Hinges at Exterior Doors: BHMA 630 (US32D)
    2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
    3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
    4. Protection Plates: BHMA 630 (US32D)
    5. Overhead Stops and Holders: BHMA 630 (US32D)
    6. Door Closers: Powder Coat to Match
    7. Wall Stops: BHMA 630 (US32D)
    8. Latch Protectors: BHMA 630 (US32D)
    9. Weatherstripping: Clear Anodized Aluminum
    10. Thresholds: Mill Finish Aluminum

## PART 2 - EXECUTION

### 1.27 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

### 1.28 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
  1. Standard Steel Doors and Frames: ANSI/SDI A250.8.

2. Custom Steel Doors and Frames: HMMA 831.
  3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
  4. Installation Guide for Doors and Hardware: DHI TDH-007-20
- B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.
- C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.
- I. Lock Cylinders:
1. Install construction cores to secure building and areas during construction period.
  2. Replace construction cores with permanent cores as indicated in keying section.
  3. Furnish permanent cores to Owner for installation.
- J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:
1. Conduit, junction boxes and wire pulls.
  2. Connections to and from power supplies to electrified hardware.
  3. Connections to fire/smoke alarm system and smoke evacuation system.
  4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
  5. Connections to panel interface modules, controllers, and gateways.
  6. Testing and labeling wires with Architect's opening number.
- K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- L. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
- M. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- N. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
- O. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

- P. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- Q. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- R. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- S. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

#### 1.29 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  - 1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
  - 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
  - 3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

#### 1.30 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items per manufacturer's instructions to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

#### 1.31 DOOR HARDWARE SCHEDULE








- A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
- B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.
- C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

Hardware Group No. 01

For use on Door #(s):

104B-1\_SUMN 105A-1 106A-1 109-1\_SUMN 110-1 115-1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
			F OR J KEYWAY-CONSULT			
			SWOCC			
1	EA	SURFACE CLOSER	4011 TBWMS		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK		BK	ZER








6

Hardware Group No. 02

For use on Door #(s):

103-1 104G-1 106-01

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	CLASSROOM SECURITY	ND75TD RHO XQ07-351 XN12-035		626	SCH
2	EA	FSIC CORE	23-030		626	SCH
			F OR J KEYWAY-CONSULT			
			SWOCC			
1	EA	OH STOP	90S		630	GLY
1	EA	SURFACE CLOSER	4011 TBWMS		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK		BK	ZER








7

Hardware Group No. 03

For use on Door #(s):

108-1\_SUMN

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	PRIVACY WITH OCCUPIED INDICATOR	L9456T 06A L583-363 L283-722 XL11-422		626	SCH
1	EA	FSIC CORE	23-030		626	SCH
			F OR J KEYWAY-CONSULT			
			SWOCC			
1	EA	SURFACE CLOSER	4011 TBWMS		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK		BK	ZER







6

Hardware Group No. 04

For use on Door #(s):

104C-1      104E-1      104E-2      114-2      114-3

Provide each SGL door(s) with the following:






QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	CLASSROOM SECURITY	ND75TD RHO XQ07-351 XN12-035		626	SCH
2	EA	FSIC CORE	23-030 F OR J KEYWAY-CONSULT SWOCC		626	SCH
1	EA	OH STOP	90S		630	GLY
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK		BK	ZER

Hardware Group No. 05

For use on Door #(s):

104D-1      104F-1      112C-1      112D-1      112E-1      112F-1

Provide each SGL door(s) with the following:








QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50TD RHO		626	SCH
1	EA	FSIC CORE	23-030 F OR J KEYWAY-CONSULT SWOCC		626	SCH
1	EA	WALL STOP	WS406/407CCV		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 06

For use on Door #(s):

112-1      112A-1      117-1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	CLASSROOM SECURITY	ND75TD RHO XQ07-351 XN12-035		626	SCH
2	EA	FSIC CORE	23-030 F OR J KEYWAY-CONSULT SWOCC		626	SCH
1	EA	SURFACE CLOSER	4011 TBWMS		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK		BK	ZER











Hardware Group No. 07

For use on Door #(s):

105-1                      105-2                      113-1                      113-2

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	PANIC HARDWARE	LD-98-L-2SI-06		626	VON
2	EA	RIM CYLINDER	20-057 ICX		626	SCH
2	EA	FSIC CORE	23-030		626	SCH
			F OR J KEYWAY-CONSULT			
			SWOCC			
1	EA	SURFACE CLOSER	4111 EDA TBWMS		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK		BK	ZER

8

Hardware Group No. 08

For use on Door #(s):

100-1                      102-1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	PIVOT SET	7226 SET		626	IVE
2	EA	INTERMEDIATE PIVOT	7226 INT		626	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB		689	VON
1	EA	PANIC HARDWARE	LD-98-EO		626	VON
1	EA	PANIC HARDWARE	LD-98-NL		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX		626	SCH
2	EA	FSIC CORE	23-030		626	SCH
			F OR J KEYWAY-CONSULT			
			SWOCC			
2	EA	OH STOP	100S ADJ		630	GLY
2	EA	SURFACE CLOSER	4111 EDA TBWMS		689	LCN
2	EA	BLADE STOP SPACER	4110-61 SRT		689	LCN
1	EA	RAIN DRIP	142AA		AA	ZER
2	EA	DOOR SWEEP	8198AA		AA	ZER
1	EA	THRESHOLD	103A-223		A	ZER
1	EA	MULLION SEAL	8780NBK PSA		BK	ZER
			WEATHERSTRIP BY			
			DOOR/FRAME			
			MANUFACTURER			






16

Hardware Group No. 09

For use on Door #(s):

100-2 102-2

Provide each PR door(s) with the following:








12	QTY	DESCRIPTION	CATALOG NUMBER		FINISH	MFR
	2	EA PIVOT SET	7226 SET		626	IVE
	2	EA INTERMEDIATE PIVOT	7226 INT		626	IVE
	2	EA DUMMY PUSH BAR	350-DT-990		626	VON
	2	EA OH STOP	100S ADJ		630	GLY
	2	EA SURFACE CLOSER	4111 EDA TBWMS		689	LCN
	2	EA BLADE STOP SPACER	4110-61 SRT		689	LCN
WEATHERSTRIP BY DOOR/FRAME MANUFACTURER						

Hardware Group No. 10

For use on Door #(s):

108-1 109-1

Provide each SGL door(s) with the following:





6	QTY	DESCRIPTION	CATALOG NUMBER		FINISH	MFR
	1	EA PIVOT SET	7226 SET		626	IVE
	1	EA PUSH PLATE	8200 4" X 16"		630	IVE
	1	EA PULL PLATE	8302 6" 4" X 16" G		630	IVE
	1	EA SURFACE CLOSER	4011 TBWMS		689	LCN
	1	EA KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
	1	EA WALL STOP	WS406/407CVX		630	IVE
	3	EA SILENCER	SR64		GRY	IVE

Hardware Group No. 11

For use on Door #(s):

104A-1 104B-1










Provide each SGL door(s) with the following:

4	QTY	DESCRIPTION	CATALOG NUMBER		FINISH	MFR
	3	EA HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
	1	EA PASSAGE SET	ND10S RHO		626	SCH
	1	EA WALL STOP	WS406/407CVX		630	IVE
	3	EA SILENCER	SR64		GRY	IVE

Hardware Group No. 12

For use on Door #(s):  
114-1







Provide each SGL door(s) with the following:

8	QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
	3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
	1	EA	VANDL STOREROOM LOCK	ND96TD RHO		626	SCH
	1	EA	FSIC CORE	23-030		626	SCH
				F OR J KEYWAY-CONSULT SWOCC			
	1	EA	LOCK GUARD	LG10		630	IVE
	1	EA	SURFACE CLOSER	4111 SCUSH TBWMS		689	LCN
	1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
	1	EA	RAIN DRIP	142AA		AA	ZER
	1	EA	DOOR SWEEP	8198AA		AA	ZER
1	EA	THRESHOLD	103A-223		A	ZER	

Hardware Group No. 13

For use on Door #(s):  
107-1 112-A

Provide each SGL door(s) with the following:

5	QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
	3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
	1	EA	CLASSROOM SECURITY	ND75TD RHO XQ07-351 XN12-035		626	SCH
	2	EA	FSIC CORE	23-030		626	SCH
				F OR J KEYWAY-CONSULT SWOCC			
	1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
	1	EA	WALL STOP	WS406/407CVX		630	IVE
	1	EA	GASKETING	488SBK		BK	ZER

END OF SECTION

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SECTION 08 71 00.01- DOOR HARDWARE INDEX

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.

Door#	HwSet#
100-1	08
100-2	09
102-1	08
102-2	09
103-1	02
104A-1	11
104B-1	11
104B-1_SUMN	01
104C-1	04
104D-1	05
104E-1	04
104E-2	04
104F-1	05
104G-1	02
105-1	07
105-2	07
105A-1	01
106-1	02
106A-1	01
107-1	13
108-1	10
108-1_SUMN	03
109-1	10
109-1_SUMN	01
110-1	01
112-1	06
112A-1	13
112C-1	05
112D-1	05
112E-1	05
112F-1	05
113-1	07
113-2	07
114-1	12
114-2	04
114-3	04
115-1	01
117-1	06

END OF SECTION

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Glass for exterior glazed assemblies and doors (IGU-1 and IGU-2).
  - 2. Glass for interior glazed assemblies and doors (CGG-1, CTG-1 and CTG-2).
  - 3. Clear insulating glass (CIG-1).
  - 4. Clear tempered insulating glass (CTIG-1).
  - 5. Mirror glass (MR-1) at walls.
  - 6. One-way glass (GL-X).
  - 7. Glazing sealants and accessories.

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review temporary protection requirements for glazing during and after installation.

1.6 SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- C. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

- E. Qualification Data: For Installer, manufacturers of insulating-glass units with sputter-coated, low-E coatings, glass testing agency and sealant testing agency.
- F. Product Certificates: For glass.
- G. Product Test Reports: For tinted glass, coated glass, insulating glass and glazing sealants, for tests performed by a qualified testing agency.
  - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- H. Preconstruction adhesion and compatibility test report.
- I. Sample Warranties: For special warranties.

#### 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Glazing with Sputter-Coated, Low-E Coatings: A qualified glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

#### 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

#### 1.10 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
  - 1. Warranty Period: 10 years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.



- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- C. Basis-of-Design Manufacturer: Vitro Architectural Glass; [www.vitroglazings.com](http://www.vitroglazings.com).
- D. Other Approved Manufacturers:
  - 1. AGC Glass North America; [www.agcglass.com](http://www.agcglass.com).
  - 2. Oldcastle Building Envelope; [www.obe.com](http://www.obe.com).
  - 3. Pilkington, a div. of Nippon Sheet Glass Co., Ltd; [www.pilkington.com](http://www.pilkington.com).

## 2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

## 2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. GANA Publication: "Glazing Manual."
  - 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
  - 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
- D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

## 2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
  - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- C. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

## 2.5 LAMINATED GLASS

- A. Laminated Glass: Glazing assembly of glazing layers and polyvinyl butyral (PVB) film interlayer meeting requirements of ASTM C1172 "Standard Specification for Laminated Architectural Flat Glass". Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
  1. Construction: Laminate glass with polyvinyl butyral (PVB) interlayer to comply with interlayer manufacturer's written instructions.
  2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
  3. Interlayer Color: Clear unless otherwise indicated.
  4. Basis-of-Design Product: Saflex by Eastman; [www.saflex.com](http://www.saflex.com).

## 2.6 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.
  1. Sealing System: Dual seal, with manufacturer's standard, polyisobutylene and polysulfide, polyisobutylene and silicone, polyisobutylene and hot-melt butyl, or polyisobutylene and polyurethane primary and secondary sealants.
  2. Perimeter Spacer: Manufacturer's standard spacer material and construction; black anodized or black finish.
  3. Desiccant: Molecular sieve or silica gel, or a blend of both.

## 2.7 MIRROR GLASS

- A. Mirror Glass: Mirror Glazing Quality for blemish requirements and complying with ASTM C1048 for Kind FT, Condition A, tempered float glass before silver coating is applied, Quality Q1 (mirror select).
  1. Silvered Flat Glass Mirrors, Acceptable Manufacturers:
    - a. Gilded Mirrors, Inc.; [www.gildedmirrorsinc.com](http://www.gildedmirrorsinc.com).
    - b. Walker Glass Co., Ltd.; [www.walkerglass.com](http://www.walkerglass.com).
  2. Mirror Mastic, Acceptable Manufacturers:
    - a. Franklin Intl.; [www.titebond.com](http://www.titebond.com).
    - b. C.R. Laurence, Co., Inc.; [www.crlaurence.com](http://www.crlaurence.com)
    - c. Macco Adhesives; [www.liquidnails.com](http://www.liquidnails.com).
    - d. OSI Sealants, Inc.; [www.ositough.com](http://www.ositough.com).
    - e. Palmer Products Corp.; [www.mirro-mastic.com](http://www.mirro-mastic.com).
    - f. Pecora Corp.; [www.pecora.com](http://www.pecora.com).
    - g. Royal Adhesives & Sealants; [www.royaladhesives.com](http://www.royaladhesives.com)
  3. Edge Profiles: Ground, polished unless indicated otherwise.
  4. Where existing units are fabricated mirrors, mirror glass indicated above is not applicable.

## 2.8 GLAZING TYPES

- A. Glazing Type IGU-1: Exterior clear insulated glazing unit (IGU), safety glazing.
  - 1. Overall Unit Thickness: 1 inch.
    - a. Outer Lite: 1/4 inch clear float glass, with low-emissivity (low-E) coating on no. 2 surface.
      - 1) Basis-of-Design Product, Low-E Coating: Solarban 60 by Vitro Architectural Glass; [www.vitroglazings.com](http://www.vitroglazings.com).
    - b. Interspace Content: Argon.
    - c. Inner Lite: Fully tempered 1/4 inch clear float glass.
    - d. Edge Spacer: Black; warm-edge.
  - 2. Provide safety glazing at Restrooms and other locations where Code-required.
- B. Glazing Type IGU-2: Exterior clear insulated glazing unit (IGU), general use.
  - 1. Overall Unit Thickness: 1 inch.
    - a. Outer Lite: 1/4 inch clear float glass, with low-emissivity (low-E) coating on no. 2 surface.
      - 1) Basis-of-Design Product, Low-E Coating: Solarban 60 by Vitro Architectural Glass; [www.vitroglazings.com](http://www.vitroglazings.com).
    - b. Interspace Content: Argon.
    - c. Inner Lite: 1/4 inch clear float glass.
    - d. Edge Spacer: Black; warm-edge.
  - 2. Provide safety glazing where required by code.
- C. Glazing Type, CGG-1: Structural, monolithic, clear interior glazing.
  - 1. Provide fully tempered or heat-strengthened where code required.
  - 2. Lite: 1/4 inch clear float glass.
- D. Glazing Type, CTG-1: Structural, monolithic, clear interior tempered glazing.
  - 1. Lite: 1/4 inch clear float glass.
- E. Glazing Type, CTG-2: Structural, monolithic, clear interior tempered glazing.
  - 1. Lite: 1/2 inch clear float glass.
- F. Glazing Type, MR-1: Mirrored, monolithic interior single lites.
  - 1. Mirror Glass: ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality Q1 (mirror select); Fully tempered; 1/4-inch minimum thick.
    - a. Select material thickness and/ or provide supports as required to limit mirrored glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.
    - b. Sizes: As indicated in Drawings.
  - 2. Safety glazing required.
  - 3. Applications:
    - a. Mirror glass (MR-1) at walls.
    - b. Provide additionally for mirrors within lockers, as indicated.

- G. Glazing Type, CIG-1: Interior, acoustic, clear insulating glass.
  - 1. Overall Unit Thickness: 1 inch.
  - 2. Minimum Thickness of Each Glass Lite: 6 mm.
  - 3. Outer Lite: Clear float glass, heat-strengthened or fully tempered as recommended by manufacturer.
  - 4. Interspace Content: Air.
  - 5. Inner Lite: Clear float glass, heat-strengthened or fully tempered as recommended by manufacturer.
  - 6. Application: Provide at Coaledo Hall as indicated in Drawings.
- H. Glazing Type, CTIG-1: Interior, acoustic, clear tempered insulating glass.
  - 1. Overall Unit Thickness: 1 inch.
  - 2. Minimum Thickness of Each Glass Lite: 6 mm.
  - 3. Outer Lite: Clear fully tempered as recommended by manufacturer.
  - 4. Interspace Content: Air.
  - 5. Inner Lite: Clear fully tempered as recommended by manufacturer.
  - 6. Application: Provide at Coaledo Hall as indicated in Drawings.
- I. Glazing Type, GL-X: One-way glass for interior relite.
  - 1. Lite: As selected by Architect; or as indicated on Drawings.
  - 2. Application: Provide at Sumner Hall Paramedicine Control Rooms.

## 2.9 GLAZING SEALANTS

- A. General:
  - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class as applicable to application, Use NT.

## 2.10 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:
  - 1. AAMA 804.3 tape, where indicated.
  - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
  - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
  - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.
- C. Adhesive Glazing Tape and Foam Tapes: Preformed, adhesive tape for applications indicated.
  - 1. Basis-of-Design Product: VHB Tapes by 3M; multimedia.3m.com.
    - a. Family: As recommended by manufacturer in writing for substrates and applications indicated.

## 2.11 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## 2.12 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
  - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
    - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.
- D. Decorative Film Overlay: Apply squarely aligned to glass edges, uniformly smooth, and free from tears, air bubbles, wrinkles, and rough edges, in pattern indicated on Drawings to the back face of clean glass, according to manufacturer's written instructions, including surface preparation and application temperature limitations.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  2. Minimum required face and edge clearances.
  3. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

### 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

### 3.6 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.

- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION



SECTION 08 91 19 - FIXED LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Fixed, extruded-aluminum louvers.
  - 2. Delegated design.
- B. Related Requirements:
  - 1. Section 07 25 00 "Weather Barriers" for perimeter weathersealing joint sealant.
  - 2. Section 07 92 00 "Joint Sealants" for perimeter beauty sealant.

1.3 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).
- C. Vertical Louver: Louver with vertical blades (i.e., the axes of the blades are vertical).
- D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
- E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include Project-specific plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
  - 1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
  - 2. Show perimeter integration into building air barrier system.
  - 3. Show mullion profiles and locations.
  - 4. Show screens and blank-off panels.
  - 5. Show connections and clearances to connecting ductwork and HVAC equipments, including required clearances.
- C. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- D. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.
- E. Samples: For each type of metal finish required.
- F. Qualification Data: For professional engineer.

#### 1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.2, "Structural Welding Code - Aluminum."

#### 1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 61 16 "Delegated Design Requirements," to design louvers.
- B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
  - 1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
  - 2. Other Design Loads: As indicated on Drawings.
- C. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  - 1. Design earthquake spectral response acceleration, short period (Sds) for Project: Refer to Drawings.
  - 2. Component Importance Factor: 1.0.
- D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- F. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

#### 2.2 MANUFACTURERS

- A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Acceptable Manufacturers:

1. Airolite Company, LLC; [www.airolite.com](http://www.airolite.com).
2. Construction Specialties, Inc.; [www.c-sgroup.com](http://www.c-sgroup.com).
3. Greenheck Fan Corp.; [www.greenheck.com](http://www.greenheck.com).
4. Ruskin Co.; [www.ruskin.com](http://www.ruskin.com).

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Basis-of-Design Product: B5157 by Construction Specialties (C/S) Group; [www.csgroup.com](http://www.csgroup.com).

B. Horizontal, Storm-Resistant, Drainable-Blade Louver:

1. Louver Depth: 5 inches.
2. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.060 inches for blades and 0.080 inches for frames.
3. Mullion Type: Exposed.
4. Performance Requirements:
  - a. Free Area: Not less than 8.42 sq. ft. for 48-inch wide by 48-inch high louver.
  - b. Air Performance: Per product indicated.
  - c. Wind-Driven Rain Performance: Per product indicated.
5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

C. Finish: Two-coat fluoropolymer.

1. Colors: As selected by Architect.

2.4 BLANK-OFF PANELS

A. Uninsulated, Blank-Off Panels: Metal sheet attached to back of louver.

B. Insulated, Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.

2.5 LOUVER SCREENS

A. General: Provide screen at louvers indicated.

1. Screen Location for Fixed Louvers: Interior face.
2. Screen Location for Adjustable Louvers, unless otherwise indicated.
3. Screening Type: Bird screening, unless otherwise indicated; insect screening where indicated.

B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Non-rewirable, U-shaped frames.

D. Louver Screening for Aluminum Louvers:

1. Insect Screening: Stainless steel, 1/16 by 1/16 inch mesh, 0.009-inch wire.

2. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.079-inch (2.0-mm) nominal thickness, with corners mitered and with same finish as panels.

## 2.6 MATERIALS

- A. Aluminum Extrusions: ASTM B221, alloy 6063-T5 or T-52.
- B. Aluminum Sheet: ASTM B209, alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Aluminum Castings: ASTM B26, alloy 319.
- D. Galvanized Steel Sheet: ASTM A653, Z275 zinc coating, mill phosphatized.
- E. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.
  1. Use types and sizes to suit unit installation conditions.
  2. Use hex-head or Phillips pan-head screws for exposed fasteners, unless otherwise indicated.
- F. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

## 2.7 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
  1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
  2. Horizontal Mullions: Provide horizontal mullions at joints where indicated.
- C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches o.c., whichever is less.
  1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
  2. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.

3. Exterior Corners: Prefabricated corner units with mitered blades with concealed close-fitting splices and with semirecessed mullions at corners.
- G. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

## 2.8 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish louvers after assembly.

## 2.9 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic-Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  1. Fluoropolymer Two-Coat Coating System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat with color coat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605. Mica where indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

### 3.3 INSTALLATION

- A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- F. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 07 Section "Joint Sealants" for sealants applied during louver installation.

### 3.4 ADJUSTING AND CLEANING

- A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.
- B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
- C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- D. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
  - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION

## SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Non-load-bearing steel framing systems for interior partitions.
  - 2. Suspension systems for interior gypsum ceilings and soffits.
  - 3. Grid suspension systems for gypsum board ceilings.
  - 4. Acoustic isolation components for framing.
  - 5. Delegated design.
- B. Related Requirements:
  - 1. Section 06 10 00 "Rough Carpentry" for fire retardant-treated wood blocking and plywood backing.
  - 2. Section 06 40 00 "Architectural Woodwork" for coordination of wood assemblies supported by interior partition framing.

#### 1.3 COORDINATION

- A. Coordinate opening requirements with Division 08 "Openings" Sections.
- B. Coordinate items requiring blocking and for additional support including, but not limited to the following:
  - 1. Casework and cabinets in Section 06 40 00 "Architectural Woodwork".
  - 2. Toilet partitions and accessories in Division 10 "Specialties" Sections.
  - 3. Work in soffits and suspended ceilings.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Studs and Runners: Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members."
- B. Delegated-Design Submittal: For components indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Shop Drawings: Floor and ceiling plans indicating framing size, thickness and spacing.
  - 1. Section Details: As required for framing conditions indicated.
- D. Evaluation Reports: from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction for the following:
  - 1. For steel studs and runners and firestop tracks.
  - 2. For each ceiling suspension system, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Stud Manufacturers Association, the Certified Steel Stud Association or the Steel Framing Industry Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content: Provide steel with 25 percent post-consumer recycled content.
- B. Regional Materials: If available, provide steel manufactured and containing recycled raw materials recovered within 100 mile radius of Project Site.
- C. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 61 16 "Delegated Design Requirements," to design wall framing and suspension ceiling systems.
  - 1. General: Stud gauges indicated on Drawings are minimum requirements for fire-wall rating requirements and are not to be used other than establishing the minimum requirement.
- D. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- E. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
- F. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.
- G. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft.
- H. Vertical Deflection: For ceiling joists, soffit framing and suspension systems, deflection limited to 1/360 of the span for live loads and 1/240 for total loads of the span.
  - 1. Vertical Loading: 6 lbf/sq. ft.
    - a. Provide 13 lbf/sq. ft. at ceilings indicated to have suspended items attached.
- I. Spacing:
  - 1. All interior wall and partition framing shall be 16 inches o.c. maximum. No wall assembly scheduled for tile or level 5 gypsum board finishes shall exceed 16 inches o.c. maximum.
  - 2. Wall assemblies concealed to view by cabinet or casework may be 24 inches o.c. maximum except where any portion of the wall is to receive tile finishes.
  - 3. At ceilings scheduled for level 5 finishes, framing shall be 16 inches o.c. maximum.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C754 for conditions indicated.
  - 1. Steel Sheet Components: Comply with ASTM C645 requirements for metal unless otherwise indicated.
  - 2. Protective Coating: ASTM A653, G60, hot-dip galvanized unless otherwise indicated.



- B. Studs and Runners: ASTM C645. Use either steel studs and runners or embossed steel studs and runners.
  - 1. Steel Studs and Runners:
    - a. Minimum Base-Metal Thickness: As required by performance requirements for horizontal deflection and span.
    - b. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
  - 1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to runners while allowing 2-inch minimum vertical movement.
  - 2. Double-Runner System: ASTM C645 top runners, inside runner with 2-inch deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
  - 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
  - 1. Minimum Base-Metal Thickness: As indicated on Drawings.
- E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch wide flanges.
  - 1. Depth: As indicated on Drawings.
  - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C645.
  - 1. Minimum Base-Metal Thickness: As required by performance requirements for horizontal deflection and span.
  - 2. Depth: As indicated on Drawings.
- G. Resilient Furring Channels: 1/2-inch deep, steel sheet members designed to reduce sound transmission.
  - 1. Configuration: Asymmetrical or hat shaped.
- H. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch wide flanges.
  - 1. Depth: As indicated on Drawings.
  - 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
  - 3. Tie Wire: ASTM A641, Class 1 zinc coating, soft temper, 0.062-inch diameter wire, or double strand of 0.048-inch diameter wire.
- I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.
- J. Drywall Track System: Provide at wall assemblies as indicated.
  - 1. Basis-of-Design Manufacturer: Versa Dry, LLC; [www.versadryllc.com](http://www.versadryllc.com).

## 2.3 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A641, Class 1 zinc coating, soft temper, 0.062-inch diameter wire, or double strand of 0.048-inch diameter wire.
- B. Hanger Attachments to Metal Decking: Of type suitable for application and approved by Architect and Engineer.
  - 1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E1190, conducted by a qualified testing and inspecting agency.
- C. Wire Hangers: ASTM A641, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Flat Hangers: Steel sheet, size as required for application, with thickness required by performance requirements.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness required by performance requirements and minimum 1/2-inch wide flanges.
  - 1. Depth: 2 inches; as required or indicated.
- F. Furring Channels (Furring Members):
  - 1. Cold-Rolled Channels: Minimum 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
  - 2. Steel Studs and Runners: ASTM C645.
    - a. Minimum Base-Metal Thickness: As required by performance requirements for deflection and span.
    - b. Depth: As indicated on Drawings.
  - 3. Embossed Steel Studs and Runners: ASTM C645.
    - a. Minimum Base-Metal Thickness: As required by performance requirements for deflection and span.
    - b. Depth: As indicated on Drawings.
  - 4. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.
    - a. Minimum Base-Metal Thickness: As required by performance requirements for deflection and span.
  - 5. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.
    - a. Configuration: Asymmetrical or hat shaped.
- G. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.
- H. Acoustic Isolation Components for Ceiling Framing:
  - 1. Ceiling Spring Isolators, Standard Profile, Basis-of-Design Product: ICC Deck-Suspended Ceiling Hanger by Kinetics Noise Control, Inc.; [www.kineticsnoise.com](http://www.kineticsnoise.com).
    - a. Deflection Range: One-inch rated deflection spring.
    - b. Clearance Required: 10 inches; standard profile.

2. Ceiling Spring Isolators, Low-Profile, Basis-of-Design Product: KSCH by Kinetics Noise Control, Inc.; [www.kineticsnoise.com](http://www.kineticsnoise.com).
  - a. Deflection Range: One-inch rated deflection spring.
  - b. Clearance Required: 3-1/2 inches; low-profile.

#### 2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
  1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide the following:
  1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
  1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
  1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
  2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

#### 3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
  1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.
  - 1. Provide cantilevered framing where both sides of joints are to be single-member spanned.

### 3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
  - 2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
  - 3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
  - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
    - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
  - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- E. Direct Furring:
  - 1. Screw to framing.
  - 2. Weld or screw attach to structural framing, where permitted by Structural Engineer of Record.

- F. Z-Shaped Furring Members: Where indicated or required.
  - 1. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch in 10 feet, measured from the plane formed by faces of adjacent framing.

### 3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Hangers: 48 inches o.c.
  - 2. Carrying Channels (Main Runners): 48 inches o.c.
  - 3. Furring Channels (Furring Members): 16 inches o.c., or as indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
    - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
  - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  - 5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  - 6. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

SECTION 09 26 13 - GYPSUM VENEER PLASTERING

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. Gypsum veneer plaster and gypsum base for interior veneer plaster.
- B. Related Requirements:
  - 1. Section 06 10 00 "Rough Carpentry" for non-load-bearing wood partition framing.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
  - 1. Show locations, fabrication, and installation of control joints, reveals, and trim; include plans, elevations, sections, details of components, and attachments to other work.
- C. Samples: For the following products:
  - 1. Textured Finishes: Where applicable for matching existing conditions, provide manufacturer's standard size, for each textured finish and on rigid backing.

1.4 QUALITY ASSURANCE

- A. Mockups: Provide a full-thickness finish mockup for each type and finish of gypsum veneer plaster and substrate to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Architect will select representative surfaces and conditions for application of each type of gypsum veneer plaster and substrate.
  - 2. Provide mockups of partitions in sizes of at least 100 sq. ft.
  - 3. Apply gypsum veneer plaster, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, and 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.
- C. Stack panels flat on leveled supports off floor or slab to prevent sagging.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C843 requirements or gypsum veneer plaster manufacturer's written recommendations, whichever are more stringent.

- B. Room Temperatures: Maintain not less than 55 deg F or more than 80 deg F for seven days before application of gypsum base and gypsum veneer plaster, continuously during application, and after application until veneer plaster is dry.
- C. Avoid conditions that result in gypsum veneer plaster drying too rapidly.
  - 1. Distribute heat evenly; prevent concentrated or uneven heat on veneer plaster.
  - 2. Maintain relative humidity levels, for prevailing ambient temperature, that produce normal drying conditions.
  - 3. Ventilate building spaces in a manner that prevents drafts of air from contacting surfaces during veneer plaster application until it is dry.
- D. Do not install panels that are wet, moisture damaged, mold damaged, or faded from overexposure to sunlight.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain gypsum veneer plaster products, including gypsum base for veneer plaster, joint reinforcing tape, and embedding material, from single manufacturer.
- B. Basis-of-Design Manufacturer: USG Corporation; [www.usg.com](http://www.usg.com).

### 2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

### 2.3 GYPSUM VENEER PLASTER

- A. High-Strength, One-Component Gypsum Veneer Plaster: ASTM C587, ready-mixed, smooth, finish-coat veneer plaster containing mill-mixed, fine silica sand; with a compressive strength of 3000 psi when tested according to ASTM C472; and formulated for application directly over substrate without use of separate base-coat material. Not for installation at masonry substrates.
  - 1. Schedule for Finishes: Except as specified herein, refer to "Finish Schedule" in Drawings for attributes and description of basis-of-design manufacturers and products to be provided and installed by the Contractor.
  - 2. Basis-of-Design Product: Acoustical Plaster Finish by USG.
  - 3. Provide 1/8-inch thick plaster coat, hand troweled smooth finish.
  - 4. Applications: As indicated.

### 2.4 PANEL PRODUCTS

- A. Panel Size: Provide panels in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.



- B. Gypsum Base for Veneer Plaster, Type X: ASTM C1396, with facing for veneer plaster assemblies.
  - 1. Thickness: 5/8 inch.

## 2.5 TRIM ACCESSORIES

- A. Provide anodized or prefinished trim as recommended by manufacturer to limit cracking and isolate portions of the wall for repair.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
  - 1. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221, Alloy 6063-T5.
  - 2. Finish: Anodized or prefinished as recommended by plaster manufacturer. Prefinished shall be corrosion-resistant primer compatible with veneer plaster and ready for painting to match adjacent finishes.

## 2.6 JOINT-REINFORCING MATERIALS

- A. General: Comply with joint strength requirements in ASTM C587 and with gypsum veneer plaster manufacturer's written recommendations for each application indicated.
- B. Joint Tape:
  - 1. Gypsum Base for Veneer Plaster: As recommended by gypsum veneer plaster manufacturer for applications indicated; open-mesh, glass fiber.
- C. Embedding Material for Joint Tape:
  - 1. Gypsum Base for Veneer Plaster: As recommended by gypsum veneer plaster manufacturer for use with joint-tape material and gypsum veneer plaster applications indicated.

## 2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced product standards and manufacturer's written recommendations.
- B. Bonding Agent: ASTM C631 polyvinyl acetate, for use at masonry and concrete substrates.
- C. Laminating Adhesive: Adhesive or joint compound recommended by manufacturer for directly adhering gypsum-base, face-layer panels to backing-layer panels in multilayer construction.
- D. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
  - 1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick where installed on exterior metal framing.
- E. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- F. Sound Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing), produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
  - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- G. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.

- H. Patching Mortar: Dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Existing Substrates and Repair: Prepare existing veneer plaster assemblies as recommended by manufacturer for repairing procedures.

#### 3.3 INSTALLING PANELS, GENERAL

- A. Gypsum Base for Veneer Plaster: Apply according to ASTM C844 unless manufacturer's written recommendations are more stringent.
  - 1. Do not allow gypsum base to degrade from exposure to sunlight, as evidenced by fading of paper facing.
  - 2. Erection Tolerance: No more than 1/16-inch offsets between planes of gypsum base panels, and 1/8 inch in 8 feet noncumulative, for level, plumb, warp, and bow.
- B. Install sound attenuation blankets before installing gypsum base for veneer plaster.
- C. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not locate joints, other than control joints, at corners of framed openings.
- F. Attach panels to steel studs, so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach panels to framing provided at openings and cutouts.
- H. Form control joints with space between edges of adjoining panels.
- I. Cover both sides of partition framing with panels in concealed spaces, including above ceilings, except in internally braced chases.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
  - 2. Fit panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- wide joints; seal joints with acoustical sealant.

- J. Wood Framing: Install panels over wood framing, with "floating" internal corner construction. Do not attach panels across the flat grain of wide-dimension lumber, including floor joists and headers. "Float" panels over these members or provide control joints to counteract wood shrinkage.
- K. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- L. Fastener Spacing: Comply with ASTM C844, manufacturer's written recommendations, and fire-resistance-rating requirements.
  - 1. Space screws a maximum of 12 inches o.c. along framing members for wall or ceiling application.

### 3.4 INSTALLING PANELS

- A. Install panels for veneer plaster in locations indicated in Drawings.
- B. Single-Layer Application:
  - 1. On ceilings, apply gypsum base panels before wall panels, to the greatest extent possible and at right angles to framing unless otherwise indicated.
  - 2. On walls, apply gypsum base panels horizontally and perpendicular to framing unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    - b. At stairwells and other walls higher than 30 feet, install gypsum base panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
  - 3. On Z-furring, apply gypsum base panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- C. Multilayer Application on Ceilings: Apply backing panels for ceilings before applying backing panels for partitions; apply gypsum-base face layers in same sequence. Apply backing panels at right angles to framing members and offset gypsum-base, face-layer joints a minimum of 16 inches from parallel backing panel joints unless otherwise required by fire-resistance-rated assembly.
- D. Multilayer Application on Partitions: Apply backing panels indicated and gypsum-base face layers vertically (parallel to framing), with joints of backing panels located over stud or furring members and gypsum-base, face-layer joints offset at least one stud or furring member from backing-panel joints, unless otherwise required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
  - 1. Z-Furring: Apply backing panels vertically (parallel to framing) and gypsum-base face layer either vertically or horizontally (perpendicular to framing), with vertical joints offset at least one furring member. Locate edge joints of backing panels over furring members.
- E. Fasteners: Drive fasteners flush with gypsum base surface. Do not overdrive fasteners or cause surface depressions.
- F. Single-Layer Fastening Methods: Apply gypsum base panels to supports with steel drill screws.

- G. Multilayer Fastening Methods: Fasten backing panels and gypsum-base face layers separately to supports with screws.
  - 1. Where cementitious backer units abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

### 3.5 INSTALLING TRIM ACCESSORIES

- A. General: Install trim with back flanges intended for fasteners, and attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install according to ASTM C844 and in specific locations approved by Architect.
- C. Aluminum Trim:
  - 1. Apply and embed joint tape over flanges of aluminum trim accessories if recommended by trim manufacturer.

### 3.6 INSTALLING JOINT REINFORCEMENT

- A. Gypsum Base: Reinforce interior angles and flat joints with joint tape and embedding material to comply with ASTM C843 and with gypsum veneer plaster manufacturer's written recommendations.

### 3.7 GYPSUM VENEER PLASTERING

- A. Bonding Agent: Apply bonding agent on dry monolithic concrete and masonry according to gypsum veneer plaster manufacturer's written recommendations.
- B. Gypsum Veneer Plaster Mixing: Mechanically mix gypsum veneer plaster materials to comply with ASTM C843 and with gypsum veneer plaster manufacturer's written recommendations.
- C. Gypsum Veneer Plaster Application: Comply with ASTM C843 and with veneer plaster manufacturer's written recommendations.
  - 1. One-Component Gypsum Veneer Plaster: Trowel apply plaster over substrate to uniform thickness. Fill all voids and imperfections. Immediately double back with same mixer batch of plaster to a uniform total thickness of 1/8-inch.
  - 2. Where gypsum veneer plaster abuts metal, including doorframes, windows and other units, groove finish coat to eliminate spalling.
  - 3. Do not apply veneer plaster to gypsum base if paper facing has degraded from exposure to sunlight. Before applying veneer plaster, use remedial methods to restore bonding capability to degraded paper facing according to manufacturer's written recommendations and as approved by Architect.
- D. Concealed Surfaces: Do not omit gypsum veneer plaster behind cabinets, furniture, furnishings, and similar removable items. Omit veneer plaster in the following areas where it will be concealed from view in the completed Work unless otherwise indicated or required to maintain fire-resistance and STC ratings:
  - 1. Above suspended ceilings.
  - 2. Behind wood paneling.
- E. Gypsum Veneer Plaster Finish: Smooth-troweled finish unless otherwise indicated. Finishing shall comply with and match gypsum board finishing requirements of ASTM C840 Level 5 finish.

### 3.8 PROTECTION

- A. Protect installed gypsum veneer plaster from damage from weather, condensation, construction, and other causes during remainder of the construction period.

- B. Remove and replace gypsum veneer plaster and gypsum base panels that are wet, moisture damaged, or mold damaged.
  - 1. Indications that gypsum base panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
  - 2. Indications that gypsum base panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

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## SECTION 09 29 00 - GYPSUM BOARD

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

1. Interior gypsum board (GWB-1 and GWB-3)
2. Tile backing (GWB-4).
3. Mullion trim cap (MC-1).
4. Drywall reveal (DR-1).
5. Acoustic insulation.
6. Acoustical sealant.
7. Acoustic resilient furring channels.

- B. Related Requirements:

1. Section 06 16 00 "Sheathing" for exterior wall and parapet sheathing.
2. Section 09 22 16 "Non-Structural Metal Framing" for coordinating backing and blocking requirements.
3. Section 09 30 00 "Tiling" for coordination of cementitious backer units installed as substrates for tile.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product.

- B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

- C. Shop Drawings: For casing beads, moldings, panel transitions and closure profiles.

1. Include elevations showing typical and unique conditions, openings, reveals, panel edges, control and expansion joints and transitions.
2. Show details of special conditions and Project specific details.
3. Show details of wall closures and terminations, including acoustical wall closures.

#### 1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for the following:

- a. Level 4 of gypsum board finish indicated for use in exposed locations.
- b. As associated with the wall paneling or applied finishes.
- c. Exterior, exposed soffits.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.5 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

#### 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
  1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content: Provide regular gypsum board with minimum 80 percent recycled content, including recycled content face paper.
- B. Regional Materials: If available, provide gypsum board manufactured and containing recycled raw materials recovered within 100 mile radius of Project Site.
- C. Gypsum Board, Cement Board, and Insulation Installed Within the Building Interior: Comply with California Department of Public Health (CDPH) Standard Method V1.1-2010 or Greenguard Gold certification.
- D. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
- E. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

#### 2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
- B. Basis-of-Design Manufacturer: American Gypsum; [www.americangypsum.com](http://www.americangypsum.com).
- C. Other Approved Manufacturers:
  1. USG Corp.; [www.usg.com](http://www.usg.com).
  2. CertainTeed Corp.; [www.certainteed.com](http://www.certainteed.com).
  3. Georgia Pacific; [www.gp.com](http://www.gp.com).



4. National Gypsum Co.; [www.nationalgypsum.com](http://www.nationalgypsum.com).
5. PABCO Gypsum; [www.pabco gypsum.com](http://www.pabco gypsum.com).
6. Products listed in UL assemblies and required for rated-wall assemblies.

## 2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard, General: Do not provide 1/2 inch, regular type gypsum board at walls. All gypsum wall board material is to be type 'X' and 5/8 inch thickness unless otherwise indicated.
- B. Gypsum Board, GWB-1: Type X, ASTM C1396.
  1. Basis-of Design Manufacturer: American Gypsum Company, LLC.; [www.americangypsum.com](http://www.americangypsum.com).
  2. Thickness: 5/8 inch.
  3. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
  4. Applications: Provide at the following locations and others as indicated:
    - a. All walls scheduled for gypsum wall board.
    - b. Rated partitions.
    - c. Rated ceilings and soffits.
  5. Finish: Refer to Section 09 91 00 "Painting" paint colors; or as indicated.
- C. Moisture- (Mold-) Resistant Gypsum Board, GWB-3: ASTM C1396. With moisture- and mold-resistant core and paper surfaces.
  1. Basis-of Design Manufacturer: American Gypsum Company, LLC.; [www.americangypsum.com](http://www.americangypsum.com).
  2. Core: 5/8 inch, Type X AquaBloc.
  3. Long Edges: Tapered.
  4. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D 3274.
  5. Application: Moisture- (mold-) resistant gypsum board shall be provided in lieu of regular gypsum wall board at all backsplash and surrounding areas of sinks, lavatories, drinking fountains and mop sinks, to a distance not less than 18 inches from edge of sinks, lavatories and mop sinks.
  6. Applications: Provide at the following locations and others as indicated:
    - a. Walls adjacent to water fountains and water coolers.
    - b. Walls within Janitor or Custodial Closets.
    - c. Walls adjacent to lavatories and sinks unless tile finish is indicated.
  7. Finish: Refer to Section 09 91 00 "Painting" paint colors; or as indicated.

## 2.4 TILE BACKING PANELS

- A. Cementitious Backer Units, GWB-4: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.
  1. Basis-of-Design Product: Durock GlasMat by USG Corporation; [www.usg.com](http://www.usg.com).
  2. Thickness: 1/2-inch, non-gypsum based.
  3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
  4. Finish: Refer to Section 09 91 00 "Painting" paint colors; or as indicated.

2.5 MULLION TRIM CAP

- A. Basis-of-Design Product, MC-1: Mull-It-Over 55 by Mull-It-Over Products; [www.mullitoverproducts.com](http://www.mullitoverproducts.com).
1. Finish: To match the adjacent wall.
  2. Application: Provide at Coaledo Hall; or as indicated in Drawings.

2.6 DRYWALL REVEAL

- A. Basis-of-Design Product, DR-1: Drywall F Reveal | DRMF by Fry Reglet Co.; [www.fryreglet.com](http://www.fryreglet.com).
1. Color: Buffed Brite Stainless Steel.
  2. Finish: As selected by Architect.
  3. Application: Provide at columns to gypsum boards at Coaledo Hall.

2.7 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
  2. Shapes:
    - a. Cornerbead.
    - b. Bullnose bead.
    - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - d. L-Bead: L-shaped; exposed long flange receives joint compound.
    - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
    - f. Expansion (control) joint.
    - g. Curved-Edge Cornerbead: With notched or flexible flanges.
- B. Exterior Trim: ASTM C1047.
1. Material: Hot-dip galvanized-steel sheet, or rolled zinc.
  2. Shapes:
    - a. Cornerbead.
    - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.
- C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
1. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221, Alloy 6063-T5.
  2. Finish:
    - a. Where indicated to be field-painted: Corrosion-resistant primer compatible with joint compound and finish materials specified.
    - b. Where indicated to be factory-painted: Baked-enamel finish.
    - c. Where indicated to retain factory anodized finish: Class II anodic finish.

3. Basis-of-Design Manufacturers:
    - a. Fry Reglet; [www.fryreglet.com](http://www.fryreglet.com).
    - b. Milgo Bufkin; [www.milgo-bufkin.com](http://www.milgo-bufkin.com).
  - D. Acoustical Wall Closure: Partition closure at window systems; where indicated.
    1. Basis-of-Design Product: Mullion Mate by Gordon Interior Specialties Division, Gordon Inc.; [www.gordoninteriors.com](http://www.gordoninteriors.com).
    2. General: Provide finishes free from surface blemishes.
    3. Finish: As selected by Architect.
      - a. Powder coat: Match metal flashing where indicated. Refer to Section 07 62 00 "Sheet Metal Flashing and Trim."
- 2.8 JOINT TREATMENT MATERIALS
- A. General: Comply with ASTM C475.
  - B. Joint Tape:
    1. Interior Gypsum Board: Fiberglass mesh.
    2. Exterior Glass-Mat Gypsum Soffit Board: 10-by-10 glass mesh, or as recommended by board manufacturer.
    3. Tile Backing Panels: As recommended by panel manufacturer.
  - C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
    1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
    2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
    3. Fill Coat: For second coat, use setting-type, sandable topping or drying-type, all-purpose compound.
    4. Finish Coat: For third coat, use drying-type, all-purpose compound.
    5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
  - D. Joint Compound for Exterior Applications:
    1. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.
  - E. Joint Compound for Tile Backing Panels:
    1. Cementitious Backer Units: As recommended by backer unit manufacturer and compatible with tile applications. Do not use gypsum compound.
- 2.9 AUXILIARY MATERIALS
- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
  - B. Soffit Vent:
    1. Basis-of-Design Product: As selected by Architect.
    2. Material: Aluminum.

3. Color: "White".
- C. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- D. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
  1. For panels attached to heavy gauge cold-formed metal framing specified in Section 05 40 00 "Cold-Formed Metal Framing" use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
  2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- E. Acoustic Insulation:
  1. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
  2. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
  3. Basis-of-Design Product: Sound Attenuation Batts by Owens Corning; [www.owenscorning.com](http://www.owenscorning.com).
    - a. Thickness: As required to fill stud cavity in friction-fit application.
- F. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Reduces airborne sound transmission through perimeter joints and openings in building construction; tested to ASTM E90. Coordinate with Section 07 92 00 "Joint Sealants" requirements.
- G. Resilient Furring Channels: ASTM C645; 1/2-inch-deep, steel sheet members designed to reduce sound transmission.
  1. Configuration: Asymmetrical or hat shaped.
  2. Applications: As indicated at acoustical wall types.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered

edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
  - 1. Comply with manufacturer's installation instruction for installing acoustic gypsum board panels.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Type X: All vertical surfaces, including where required for fire-resistance-rated assembly, unless otherwise indicated.
  - 2. Flexible Type: Apply in double layer at curved assemblies.
  - 3. Ceiling Type: Ceiling surfaces.
  - 4. Impact-Resistant Type: As indicated on Drawings.
  - 5. Moisture- (Mold-) Resistant Type: As indicated on Drawings.
  - 6. Type C: Where required for specific fire-resistance-rated assembly indicated.
  - 7. Glass-Mat Interior Type: As indicated on Drawings.
- B. Single-Layer Application:
  - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
  - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

- b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
    - 3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
    - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
  - C. Multilayer Application:
    - 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
    - 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
    - 3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
    - 4. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.
      - a. Exception: Where required by Code for fire-resistance-rated assemblies, fasten base layers and face layers separately to supports with screws.
  - D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- 3.4 APPLYING TILE BACKING PANELS
- A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
  - B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces. Do not provide glass-mat or cementitious backer units at locations indicated to receive paint finish. Provide transition from tile backing panels to other panels at tile and paint finish interfaces.
  - C. Do not install gypsum board joint compound on tile backing panel joints.
- 3.5 INSTALLING TRIM ACCESSORIES
- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
    - 1. Locate trim profiles in approved shop drawing submittal.
  - B. Control Joints: Install control joints at locations indicated on Drawings, or if not indicated, according to ASTM C840 and in specific locations approved by Architect for visual effect.
  - C. Interior Trim: Install in the following locations:
    - 1. Cornerbead: Use at outside corners unless otherwise indicated.
    - 2. LC-Bead: Use at exposed panel edges.

- 3. L-Bead: Use where indicated.
- 4. U-Bead: Use where indicated.
- D. Aluminum Trim: Install in locations indicated on Drawings.
- E. Acoustical Wall Closure: Install following manufacturer's written instructions.

### 3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
  - 1. At storage, mechanical, electrical and other utility rooms, walls, and ceilings: Gypsum board, level 3 finish.
  - 2. At all other areas, walls, and ceilings: Gypsum board level 4 finish..
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions. Do not apply gypsum joint compound. Coordinate with Section 09 30 00 "Tiling" requirements.
- F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions for finish over panels indicated or at exterior soffit board. Do not use gypsum based joint compound on glass-mat faced panel joints where behind tile finishes.

### 3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

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SECTION 09 30 00 - TILING

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. Ceramic tile (CT-1)
  - 2. Porcelain tile (PT-1, PT-2, and PT-3).
  - 3. Grout (GRT-1, GRT-2, GRT-3, GRT-4)
  - 4. Metal trim (TRANS-3, TRANS-5, TRANS-6, TRANS-7, and TRANS-11).
  - 5. Waterproof and crack isolation membrane.
- B. Related Requirements:
  - 1. Section 07 92 00 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
  - 2. Section 09 29 00 "Gypsum Board" for tile backer board.

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.
- D. Samples for Verification:
  - 1. Full-size units of each type and composition of tile and for each color and finish required.
  - 2. Full-size units of each type of trim and accessory for each color and finish required.

- E. Qualification Data: For Installer.
- F. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- G. Product Certificates: For each type of product.
- H. Product Test Reports: For tile-setting and -grouting products and certified porcelain tile.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
  - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Meet one of the requirements below:
  - 1. Installer is a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
  - 2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
  - 3. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

#### 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

### PART 2 - PRODUCTS

#### 2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
  - 1. Where tile is indicated for installation in swimming pools, on exteriors, or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

## 2.2 MANUFACTURERS

- A. Basis-of-Design Manufacturers:
  - 1. DalTile; [www.daltile.com](http://www.daltile.com).
  - 2. Emser Tile; [www.emser.com](http://www.emser.com).

## 2.3 TILE PRODUCTS

- A. Ceramic Tile:
  - 1. Basis-of-Design Product, CT-1: Color Wheel Classic 3 by 6 inches Wall tile by DalTile.
  - 2. Size: 3 by 6 inches.
  - 3. Thickness: As selected by Architect.
  - 4. Tile Colors: Provide at color no. K175 "Biscuit" at Sumner Hall.
  - 5. Trim Style: Bullnose.
  - 6. Grout: Refer to, GRT-4, Grout Material article below and as indicated on Drawings.
  - 7. Patterns: As indicated on Drawings.
  - 8. Accessories: Provide bullnose top edge trim as indicated.
  - 9. Finish: Gloss.
  - 10. Application: Provide at Sumner Hall Wall Tile; or as indicated in Drawings.
- B. Porcelain Tile, PT-1:
  - 1. Basis-of-Design Product: Keystones by DalTile.
    - a. Size: 2 by 2 inches
    - b. Thickness: 1/4 inch.
    - c. Tile Color: "Desert Gray Speckle".
    - d. Pattern: Straight joint.
    - e. Grout: Refer to, GRT-1, Grout Material article below and as indicated on Drawings.
    - f. Grout Joint: 1/8 inch.
    - g. Finish: Matte.
    - h. Accessories: Provide build up cover base as indicated in Drawings.
    - i. Application: Provide at Sumner Hall floor tile as indicated in Drawings.
- C. Porcelain Tile, PT-2:
  - 1. Basis-of-Design Product: Mixt, Mineral by Emser Tile.

- a. Size: 12 by 24 inches
  - b. Thickness: 9mm.
  - c. Tile Color: "Greige".
  - d. Pattern: Running bond layout with 1/3 offset.
  - e. Accessories:
    - 1) Uncoupling Membrane:
      - a) Basis-of-Design Product: DITRA Thickset by Schluter Systems; [www.schluter.com](http://www.schluter.com).
  - f. Grout: Refer to, GRT-2, Grout Material article below and as indicated on Drawings.
  - g. Grout Joint: 1/8 inch.
  - h. Finish: Matte.
  - i. Application: Provide at Coaledo Hall Floor Tile as indicated in Drawings.
- D. Porcelain Tile, PT-3:
- 1. Basis-of-Design Product: Fixt Cement - Enhance by Emser Tile.
    - a. Size: 12 by 24 inches
    - b. Thickness: 9mm.
    - c. Tile Color: "White".
    - d. Pattern: Stacked bond layout.
    - e. Grout: Refer to, GRT-3, Grout Material article below and as indicated on Drawings.
    - f. Grout Joint: 1/8 inch.
    - g. Finish: Matte.
    - h. Application: Provide at Coaledo Hall Wall Tile as indicated in Drawings.

## 2.4 WATERPROOFING AND CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Sheet Membrane: Polyethylene faced on both sides with non-woven polypropylene; compatible with liquid rubber polymer waterproofing.
  - 1. Nominal Thickness: 0.050 to 0.070 inch.
  - 2. Basis-of-Design Products:
    - a. Hydro Ban Sheet Membrane by Laticrete International, Inc.; [www.laticrete.com](http://www.laticrete.com).
    - b. Kerdi 200 by Schluter Systems L.P.; [www.schluter.com](http://www.schluter.com).
- C. Fluid-Applied Tiling Membrane: Single component self-curing liquid rubber polymer; compatible with polyethylene-polypropylene sheet waterproofing.
  - 1. Basis-of-Design Product: Hydro Ban by Laticrete International, Inc.; [www.laticrete.com](http://www.laticrete.com).
- D. Waterproofing and Crack Isolation Accessories: Utilize manufacturers standard tapes, bands, corners and recommended adhesives to provide a complete and warrantable system.

2.5 UNCOUPLING MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Corrugated Polyethylene: Corrugated polyethylene with dovetail-shaped corrugations and with anchoring webbing on the underside; 3/16-inch nominal thickness.
  - 1. Basis-of-Design Product: Ditra by Schluter Systems L.P.; [www.schluter.com](http://www.schluter.com)
- C. Uncoupling Accessories: Utilize manufacturer's standard tapes, bands, corners and recommended adhesives to provide a complete and warrantable system.

2.6 SETTING MATERIALS

- A. Standard Dry-Set Mortar (Thinset): ANSI A118.1.
  - 1. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.1.
- B. Modified Dry-Set Mortar (Thinset): ANSI A118.4.
  - 1. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.7 GROUT MATERIALS

- A. Products General:
  - 1. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
  - 2. Standard Cement Grout: ANSI A118.6.
  - 3. High-Performance Tile Grout: ANSI A118.7.
- B. Manufacturers:
  - 1. Basis-of-Design Manufacturers:
    - a. Custom Building Products; [www.custombuildingproducts.com](http://www.custombuildingproducts.com).
    - b. Mapei S.p.A.; [www.mapei.com](http://www.mapei.com).
    - c. Or approved equal.
- C. Grout, GRT-1:
  - 1. Basis-of-Design Products:
    - a. Custom Building Products Polyblend Plus Sanded Grout by Custom Building Products.
    - b. Mapei Keracolor S by Mapei.
  - 2. Type: Water-Cleanable Epoxy Modified Grout, sanded.
  - 3. Color: As selected by Architect from manufacturers standard range.
  - 4. Applications: Provide at Sumner Hall Floor Tile; or as indicated in Drawings.
- D. Grout, GRT-2:
  - 1. Basis-of-Design Products, GRT-2:
    - a. Custom Building Products Polyblend Plus Sanded Grout by Custom Building Products.

- b. Mapei Keracolor S by Mapei.
  - 2. Type: Water-Cleanable Epoxy Modified Grout, sanded.
  - 3. Color: As selected by Architect from manufacturers standard range.
  - 4. Applications: Provide at Coaledo Hall Floor Tile; or as indicated in Drawings.
- E. Grout, GRT-3:
  - 1. Basis-of-Design Products, GRT-3:
    - a. Custom Building Products Polyblend Plus Sanded Grout by Custom Building Products.
    - b. Mapei Keracolor S by Mapei.
  - 2. Type: Water-Cleanable Epoxy Modified Grout, sanded.
  - 3. Color: As selected by Architect from manufacturers standard range.
  - 4. Applications: Provide at Coaledo Hall Wall Tile; or as indicated in Drawings.
- F. Grout, GRT-4:
  - 1. Basis-of-Design Products, GRT-4:
    - a. Custom Building Products Ployblend Plus Non-Sanded Grout by Custom Building Products.
    - b. Mapei Keracolor U by Mapei.
  - 2. Type: Water-Cleanable Epoxy Modified Grout, unsanded.
  - 3. Color: As selected by Architect from manufacturers standard range.
  - 4. Applications: As indicated in Drawings.

## 2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Vapor-Retarder Membrane:
  - 1. At shower and bathtub surrounds: Provide waterproofing and crack isolation membrane.
  - 2. At restrooms, bathrooms and locker rooms, except shower and bath tub surrounds: Polyethylene sheeting, ASTM D4397, 10.0 mils thick, unless otherwise indicated.
- C. Metal Edge/ Transition Strips: Stainless steel and anodized aluminum extrusions, of profile and width shown, height to match tile and setting-bed thickness, and in maximum available lengths to minimize running joints.
  - 1. Basis-of-Design Manufacturer: Schluter Systems; [www.schluter.com](http://www.schluter.com).
  - 2. Basis-of-Design Product, TRANS-3: As selected by Architect by Schluter Systems.
    - a. Material: As selected by Architect.
    - b. Type: As selected by Architect.
    - c. Applications: Provide at Sumner Hall at porcelain tile to resilient flooring transitions.
  - 3. Basis-of-Design Product, TRANS-4: Schluter-DILEX-AHK by Schluter Systems.
    - a. Material: Aluminum.
    - b. Type: Cove Base.

- c. Applications: Provide at Coaledo Hall at floor to wall tile transitions.
- 4. Basis-of-Design Product, TRANS-5: SCHIENE, V4A by Schluter Systems.
  - a. Material: Stainless steel, Type 316 V4A.
  - b. Finish: Satin, anodized.
  - c. Applications: Provide at Coaledo and Sumner Hall at brick to resilient floor transitions.
- 5. Basis-of-Design Product, TRANS-6: RENO-RAMP by Schluter Systems.
  - a. Material: Aluminum.
  - b. Finish: Satin, anodized.
  - c. Applications: Provide at Coaledo Hall at porcelain tile to existing concrete transitions.
- 6. Basis-of-Design Product, TRANS-7: Jolly by Schluter Systems.
  - a. Material: Aluminum.
  - b. Finish: Brushed chrome, anodized.
  - c. Applications: Provide at Coaledo Hall at top edge of porcelain wall tile.
- 7. Basis-of-Design Product, TRANS-11: RENO-U by Schluter Systems.
  - a. Material: Stainless steel, Type V2A.
  - b. Finish: Brushed stainless steel.
  - c. Applications: Provide at Sumner Hall at porcelain tile to resilient flooring transitions.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

## 2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile walls installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

### 3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Wherever available, provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
  1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
  2. Where adjoining tiles on base, walls, or trim are specified or indicated to be same size, align joints.
  3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on base, walls, or trim, align joints unless otherwise indicated.
- G. Joint Widths: As indicated.
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.



1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

#### 3.4 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

#### 3.5 WATERPROOFING AND CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
- B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

#### 3.6 UNCOUPLING MEMBRANE INSTALLATION

- A. Install uncoupling membrane to comply with ANSI A118.12 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

#### 3.7 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  1. Remove grout residue from tile as soon as possible.
  2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

#### 3.8 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls.
- B. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION

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## SECTION 09 51 23 - ACOUSTICAL PANEL CEILINGS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Acoustical panel for interior ceilings (ACT-1 and ACT-2).
  - 2. Suspension systems
  - 3. Direct attachment of tiles to substrates with adhesive.
  - 4. Delegated design.
- B. Related Requirements:
  - 1. Section 01 61 16 "Delegated Design Requirements".
- C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
- C. Samples for Initial Selection: For components with factory-applied finishes.
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
  - 1. Acoustical Tiles: Set of full-size Samples of each type, color, pattern, and texture.
  - 2. Concealed Suspension-System Members: 6-inch-long Sample of each type.
  - 3. Exposed Moldings and Trim: Set of 6-inch-long Samples of each type and color.
  - 4. Seismic Clips: Full size.
- E. Delegated-Design Submittal: For seismic restraints for ceiling systems for areas exceeding 1,000 sf.
  - 1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- F. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Ceiling suspension-system members.
  - 2. Structural members to which suspension systems will be attached.
  - 3. Method of attaching hangers to building structure.

- a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
  - 4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
  - 5. Size and location of initial access modules for acoustical tile.
  - 6. Items penetrating finished ceiling and ceiling-mounted items including the following:
    - a. Lighting fixtures.
    - b. Diffusers.
    - c. Grilles.
    - d. Speakers.
    - e. Sprinklers.
    - f. Access panels.
    - g. Perimeter moldings.
    - h. Ceiling fans.
  - 7. Show operation of hinged and sliding components adjacent to acoustical tiles.
  - G. Qualification Data:
    - 1. For Professional Engineer.
    - 2. For testing agency.
  - H. Product Test Reports: For each acoustical tile ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
  - I. Evaluation Reports: For each acoustical tile ceiling suspension system and anchor and fastener type, from ICC-ES.
  - J. Field quality-control reports.
- 1.5 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For finishes to include in maintenance manuals.
- 1.6 MAINTENANCE MATERIAL SUBMITTALS
- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
    - 1. Acoustical Ceiling Units: Full-size tiles equal to 2 percent of quantity installed.
    - 2. Suspension-System Components: Quantity of each concealed grid and exposed component equal to 2 percent of quantity installed.
- 1.7 QUALITY ASSURANCE
- A. Engineer Qualifications: Qualified professional engineer responsible for delegated design, licensed in the jurisdiction in which Project is located.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Deliver acoustical tiles, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

- B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

## 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
  - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content: Provide acoustical ceiling panels with minimum 50 percent recycled content; provide steel with 25 percent post-consumer recycled content.
- B. Acoustical Ceiling Panels: Comply with California Department of Public Health (CDPH) Standard Method V1.1-2010 or Greenguard Gold certification.
- C. Delegated Design: For ceiling areas exceeding 1,000 sf, engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design seismic restraints for ceiling systems.
- D. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- E. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Class A according to ASTM E1264.
  - 2. Smoke-Developed Index: 450 or less.
- F. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Indicate design designations from UL or from the listings of another qualified testing agency.

### 2.2 MANUFACTURERS

- A. Source Limitations:
  - 1. Suspended Acoustical Tile Ceilings: Obtain each type of acoustical ceiling tile and its suspension system from single source from single manufacturer.
  - 2. Directly Attached Acoustical Tile Ceilings: Obtain each type of acoustical ceiling tile from single source from single manufacturer.

### 2.3 ACOUSTICAL PANEL

- A. Acoustical Panel Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E1264 classifications as designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- B. Acoustical Panel Ceiling, ACT-1 and ACT-2:
  - 1. Basis-of-Design Product, ACT-1: Optima Square Tegular 3252 by Armstrong; [www.armstrong.com](http://www.armstrong.com).

- a. Material: Fiberglass.
    - b. Panel Size: 24 by 48 inches.
    - c. Thickness: 1 inch.
    - d. Color: Manufacturer's standard "White".
    - e. Edge: Square tegular, for 15/16-inch grid.
    - f. Noise Reduction Coefficient (NRC): Up to 1.00.
    - g. Ceiling Attenuation Class (CAC): 26.
    - h. Articulation Class (AC): Up to 190.
    - i. Mold/Mildew Resistance: BIOBLOCK Inherent.
    - j. Sag/Humidity Resistance: HUMIGUARD Plus.
    - k. Light Reflectance: 88 percent.
  - 2. Basis-of-Design Product, ACT-2: Optima Health Zone Square tegular 3215PB by Armstrong; [www.armstrong.com](http://www.armstrong.com).
    - a. Material: Fiberglass.
    - b. Panel Size: 24 by 48 inches.
    - c. Thickness: 1-inch.
    - d. Color: Manufacturer's standard "White".
    - e. Edge: Square tegular lay-in on 15/16-inch grid.
    - f. Noise Reduction Coefficient (NRC): 0.95.
    - g. Ceiling Attenuation Class (CAC): 29.
    - h. Articulation Class (AC): 190.
    - i. Mold/Mildew Resistance: BIOBLOCK Inherent.
    - j. Sag/Humidity Resistance: HUMIGUARD Plus.
    - k. Light Reflectance: 86 percent.
  - 3. Application: As indicated in Drawings.
- 2.4 METAL SUSPENSION SYSTEM
- A. Recycled Content: Not less than 70 percent.
  - B. Suspension and Trim System:
    - 1. Basis-of-Design Product: Prelude XL 15/16-inch by Armstrong.
      - a. Duty Rating: Heavy Duty.
    - 2. Color: Manufacturer's standard "White" (WH), or as selected by Architect.
    - 3. Cloud Perimeter Trim: None.
  - C. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements of one of the following standards:
    - 1. ASTM C635 "Standard Specification for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings."

- D. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
  - 1. High-Humidity Finish: Comply with one of the following standards:
    - a. ASTM C635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

## 2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
  - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E488 or ASTM E1512 as applicable, conducted by a qualified testing and inspecting agency.
    - a. Type: Manufacturer's recommended anchors.
    - b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B633, Class SC 1 (mild) service condition.
    - c. Corrosion Protection: Stainless-steel components complying with ASTM F593 and ASTM F594, Group 1 Alloy 304 or 316.
  - 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E1190, conducted by a qualified testing and inspecting agency.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
  - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A641, Class 1 zinc coating, soft temper.
  - 2. Stainless-Steel Wire: ASTM A580, Type 304, nonmagnetic.
  - 3. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.135-inch-diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized-steel sheet complying with ASTM A653, G90 coating designation; with bolted connections and 5/16-inch-diameter bolts.
- F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate lateral forces.
- H. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical tiles in-place during a seismic event.

## 2.6 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations complying with seismic design

requirements; formed from sheet metal of same material, finish, and color as that used for of suspension-system runners.

1. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
2. Finish: Painted in color as selected from manufacturer's full range.

B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.

1. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C635 and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

## 2.7 ACOUSTICAL SEALANT

A. Acoustical Sealant: As specified in Section 07 92 00 "Joint Sealants."

## 2.8 MISCELLANEOUS MATERIALS

- A. Acoustical Tile Adhesive: Type recommended in writing by acoustical tile manufacturer, bearing UL label for Class 0-25 flame spread.
- B. Staples: 5/16-inch- long, divergent-point staples.

## 2.9 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. High-Humidity Finish: Comply with ASTM C635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

## 2.10 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
- B. Color-Coated Finish: Manufacturer's standard **powder-coat** baked paint complying with coating manufacturer's written instructions for surface preparation, pretreatment, application, baking, and minimum dry film thickness.

## 2.11 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
  1. Run grain of directional finishes with long dimension of each piece.
  2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.



## EXECUTION

### 2.12 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 2.13 PREPARATION

- A. Testing Substrates: Before adhesively bonding tiles to wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.
- B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- C. Layout openings for penetrations centered on the penetrating items.

### 2.14 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

- A. Install suspended acoustical tile ceilings according to ASTM C636, seismic design requirements, and manufacturer's written instructions.
  - 1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  - 2. Splay hangers only where required[ and, if permitted with fire-resistance-rated ceilings,] to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
  - 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.

7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  8. Do not attach hangers to steel deck tabs.
  9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
  11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical tiles.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
  3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Arrange directionally patterned acoustical tiles as follows:
1. As indicated on reflected ceiling plans.
  2. Install tiles with pattern running in one direction parallel to [long] [short] axis of space.
  3. Install tiles in a basket-weave pattern.
- G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension-system flanges into kerfed edges of tiles so tile-to-tile joints are interlocked.
1. Fit adjoining tiles to form flush, tight joints. Scribe and cut tiles for accurate fit at borders and around penetrations through ceiling.
  2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tiles and moldings, spaced 12 inches o.c.
  3. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.
- 2.15 ERECTION TOLERANCES
- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.
- B. Directly Attached Ceilings: Install bottom surface of tiles to a tolerance of 1/8 inch in 12 feet and not exceeding 1/4 inch cumulatively.
- C. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

2.16 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
  - 1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Perform the following tests and inspections of completed installations of acoustical tile ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no tiles have been installed. Do not proceed with installations of acoustical tile ceiling hangers for the next area until test results for previously completed installations of acoustical tile ceiling hangers show compliance with requirements.
  - 1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
  - 2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- D. Acoustical tile ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

2.17 ADJUSTING

- A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

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## SECTION 09 54 26 - LINEAR WOOD CEILINGS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes:
  - 1. Suspended wood ceiling panels (LWC-1).
  - 2. Concealed suspension system for ceiling panels (LWCS-1).
  - 3. Seismic restraints for suspended ceiling system.
  - 4. Trim and accessories.
  - 5. Delegated design.
- B. Related Requirements:
  - 1. Section 01 61 16 "Delegated Design Requirements".
  - 2. Section 09 22 16 "Non-Structural Metal Framing" for suspended soffit framing.
  - 3. Division 21 "Fire Suppression" Sections for fire sprinkler work to be coordinated with ceiling.
  - 4. Division 23 "Heating Ventilating and Cooling" Sections for ducts, diffusers and other mechanical work to be coordinated with ceiling.
  - 5. Division 26 "Electrical" Sections for lighting work to be coordinated with ceiling.
  - 6. Division 28 "Electrical Safety and Security" Sections for fire alarm work to be coordinated with ceiling.

#### 1.3 REFERENCES

- A. ASTM A641: Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire.
- B. ASTM C423: Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- C. ASTM C635: Standard Specifications for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
- D. ASTM C636: Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
- E. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. ASTM E580: Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.
- G. AWI (QSI): Architectural Woodwork Quality Standards Illustrated.
- H. CISCA: Ceiling Systems Handbook.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer, approved by wood ceiling manufacturer, who has completed panel ceilings similar in species, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Inspection: All work must pass inspection and approval of Architect or Owner's Authorized Representative, as well as the local codes and regulations or authorities having jurisdiction.
- C. Single-Source Responsibility for Wood Ceiling System: Obtain each type of wood ceiling panels from a single fabricator, with in-house Shop Drawing capabilities, in-house assembly and finishing capabilities, and with resources to provide products of consistent quality in appearance and physical properties without delaying the project.
- D. 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 project.
- E. Preinstallation Conference: Conduct conference at Project site.

1.5 SUBMITTALS

- A. Delegated-Design Submittal: For linear wood ceilings indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Product Data: For each type of product specified.
- C. Samples: For verification of each type of exposed finish required, prepared on samples of size indicated below. Where finishes involve normal color and texture variations, include sample sets showing the range of variations expected.
  - 1. 12 x 18 inch samples of each panel type, pattern, and color.
- D. Shop Drawings: Provide Shop Drawings/ Coordination Drawings for all ceilings; include reflected ceiling plans and product details.
- E. Qualification Data: For professional engineer.

1.6 QUALITY ASSURANCE

- A. Engineer Qualifications: Qualified professional engineer responsible for delegated design, licensed in the jurisdiction in which Project is located.

1.7 COORDINATION

- A. Coordinate ceiling panel layout and installation of wood panels and suspension system components with other construction elements that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components, partition assemblies and all perimeter conditions.

1.8 PROJECT CONDITIONS

- A. Space Enclosure and Environmental Limitations: Do not install wood panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Delivery & Unloading: Coordinate crate sizes, weights, unloading options, and delivery schedule with manufacturer prior to fabrication. Deliver wood panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where

they will be protected against damage from moisture, direct sunlight, surface contamination, and other mistreatment.

- B. Acclimatization: Before installing wood panels, permit them to reach room temperature and a stabilized moisture content (at least 72 hours) per AWI standards.
- C. Handling: Handle Wood Grille ceiling panels carefully to avoid chipping edges or damaging units in any way.
- D. Protection:
  - 1. Personnel: Follow good safety and industrial hygiene practices during handling and installing of all products and systems, with personnel to take necessary precautions and wear appropriate protective equipment as needed. Read related literature for important information on products before installation. Contractor to be solely responsible for all personal safety issues during and subsequent to installation; Architect, Owner, and Manufacturer will rely on Contractor's performance in such regard.
  - 2. Existing completed work: Protect completed work above suspension system from damage during installation of suspension system components.

#### 1.10 EXTRA MATERIALS

- A. Extra Materials: Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
  - 1. Ceiling Panels: Furnish quantity of full-size units equal to 2 percent of amount installed.
  - 2. Suspension System Components: Furnish quantity of each component equal to 2 percent of amount installed.

#### 1.11 WARRANTY

- A. Warranties: Provide owner with a one (1) year warranty for material and workmanship on all installed products.
  - 1. Manufacturers: All materials, wood ceiling and grid, shall be warranted for (1) one year from date of Substantial Completion for material and workmanship.
  - 2. Installer: All work shall be warranted for (1) year from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer; refer to Section 01 61 16 "Delegated Design Requirements" for requirements.
- B. Structural Performance: Provide suspension systems capable of withstanding design loads within limits, weights of ceiling systems supported by suspension and framed systems and under conditions indicated.
  - 1. Design suspension 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).
  - 2. Vertical Deflection: 1/360 of the span for live loads and 1/240 for total loads of the span.
- C. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

## 2.2 LINEAR WOOD CEILING

- A. Suspended Linear Wood Ceiling System, LWC-1:
  - 1. Basis-of-Design Product: Series 1100 Cross Piece Wood Ceiling Grilles by 9Wood; [www.9wood.com](http://www.9wood.com).
    - a. Veneer Species: Solid hemlock (*Conium maculatum*).
    - b. Orientation: Vertical grain.
    - c. Cut: Quarter sawn.
    - d. Panel Sizes and Spacing: As indicated in Drawings.
    - e. Fire Rating: Class 1(A) Fire Rating.
    - f. Finish: Clear.
    - g. Reveal Scrim: 1-inch Ductliner and Acoustic Scrim.
    - h. Applications: Provide at Coaledo Hall; as indicated in Drawings.
- B. Brackets and Trim Profiles: Provide profiles as indicated, in metal, finished to match wall color indicated.

## 2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Attachment Devices: Size for 3 times the design load indicated in ASTM C635, Table 1, Direct Hung unless otherwise indicated.
- B. Wire, Braces, Ties, Hanger Rods, Flat Hangers and Angle Hangers: Provide wires, rods and hangers that comply with applicable ASTM specifications.
- C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- D. Attachment Devices: Size for five times the design load indicated in one of the following:
  - 1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E1190 "Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members", conducted by a qualified testing and inspecting agency.
- E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
  - 1. Zinc-Coated Carbon-Steel Wire: Comply with one of the following:
    - a. ASTM A641, "Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire", Class 1 zinc coating, soft temper.
  - 2. Nickel-Copper-Alloy Wire: Comply with one of the following:
    - a. ASTM B164 "Standard Specification for Nickel-Copper Alloy Rod, Bar and Wire", nickel-copper-alloy UNS No. N04400.
  - 3. Size: Select wire diameter so its stress at three times hanger design load (ASTM C635, Table 1, "Direct Hung", or BS EN 13964:2004 "Suspended Ceilings-Requirements and Test Methods") will be less than yield stress of wire, but provide not less than 3.5-mm-diameter wire.
- F. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.



- G. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch thick, galvanized steel sheet complying with ASTM A653, G90 (Z275) coating designation:
  - 1. ASTM A653 "Standard specification for Sheet Steel, zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot Dip Process"; Z275.
- H. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- I. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.
- J. Single Tee Adapter Clips: At off-module cross tee connections, provide manufacturer's standard single tee adapter clips designed and spaced to secure acoustical panels in-place.
- K. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips on all cross tees.
- L. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

## 2.4 SUSPENSION SYSTEM

- A. Basis-of-Design Product, LWCS-1: Prelude XL 15/16" painted ceiling grid by Armstrong, AWI Licensing Company; [www.armstrongceilings.com](http://www.armstrongceilings.com).
  - 1. Color: Black.
  - 2. Applications: Provide at Coaledo Hall; as indicated in Drawings.
- B. Other approved equal.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. General: Examine substrates and structural framing to which ceilings attach or abut, with installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
- B. Layout: Measure each ceiling area and establish the layout of panel to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout indicated on reflected ceiling plans in accordance with wood ceiling manufacturer's approved Shop Drawings.

### 3.3 INSTALLATION

- A. General: Install to comply with manufacturer's instructions and CISCA "Ceiling Systems Handbook."
- B. Attachments: Suspend ceiling hangers from building's structural members per manufacturer's instructions and in compliance with all local codes and regulations.
- C. Metal T-Bar Grid Installation: Install, align, brace, tie-off, mount, handle interferences, and space suspension T-Grid in accordance with suspension manufacturer's instructions and in compliance with all local codes and regulations.

- D. Panel Installation: Install Wood Grille ceiling panels in accordance with manufacturer's installation instructions and in compliance with all local codes and regulations. Install with undamaged edges and fitted accurately to suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit, as required.
- E. Suspension Runners Installation: Install suspension system runners so they are square and securely interlocked with one another. Install number and use on-center spacing per wood ceiling manufacturer's instructions, as indicated on approved Shop Drawings and in compliance with all local codes.

#### 3.4 CLEANING

- A. General: Clean exposed wood surfaces of ceiling panels. Comply with manufacturer's instructions for cleaning and touchup of minor finish damage. Remove and replace wood ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

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## SECTION 09 65 00 - RESILIENT FLOORING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Resilient sheet flooring (RF-1, RF-2, RF-3, and RF-4).
  - 2. Transition strips (TRANS-9).
- B. Related Requirements:
  - 1. Section 09 65 13 "Resilient Base and Accessories" for coordination of transitions and base accessories.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Submit shop drawings showing layout, finish colors, patterns and textures.
- C. Samples for Initial Selection: For moldings and accessories.
  - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.
- D. Samples for Verification: For each type of product and finish indicated, in manufacturer's standard-size Samples of each resilient product color, texture, and pattern required.
- E. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- F. Maintenance Data: Maintenance data for installed products. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
- G. Warranty: Warranty documents specified herein

#### 1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide resilient accessories with a critical radiant flux classification of Class I, not less than 0.45 W/sq. cm, as determined by testing identical products per ASTM E648 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.
  - 1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (or more than 95 deg F), in spaces to receive resilient materials during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After post-installation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

1.7 SEQUENCING AND SCHEDULING

- A. Finishing Operations: Install flooring after finishing operations, including painting and ceiling operations etc., have been completed.

1.8 WARRANTY

- A. Manufacturer's Materials Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
  - 1. Warranty Period: One (1) year limited warranty commencing on Date of Substantial Completion. Notice of any defect must be made in writing to manufacturer within 30 days after buyer learns of the defect.
- B. Installation and Moisture Warranty: At locations where a glue-down resilient floor covering system is indicated to be installed on a concrete slab-on-grade treated with moisture retarding curing compound, and the compound has been applied according to the compound manufacturer's instructions, the tile installer shall warrant tile floor covering system against delamination due to negative-side. ground-originated moisture migration or moisture-borne contaminants for a period of 15 years from the date of original installation. The warranty shall cover labor and materials necessary to repair or replace the resilient floor covering system.
- C. Limited Wear Warranty: Manufacturer's limited wear warranty of five (5) years for heavy commercial traffic.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 MANUFACTURER

- A. Basis-of-Design Manufacturer: Tarkett; [www.commercial.tarkett.com](http://www.commercial.tarkett.com).

2.3 RESILIENT SHEET FLOORING

- A. Basis-of-Design Product, RF-1: iQ Eminent by Tarkett.
  - 1. Thickness: 0.08 inch.
  - 2. Roll Size: 6 feet-6 inches by 75 feet 6 inches, nominal.
  - 3. Colors and Patterns: No. 0883 "Sand".

4. Product Standard: ASTM F1066.
  5. Wearing Surface: Smooth.
  6. Seamless-Installation Method: Manufacturer's standard.
  7. Application: Provide at Sumner Hall; or as indicated on Drawings.
- B. Basis-of-Design Product, RF-2: iQ Eminent Unisense by Tarkett.
1. Thickness: 0.08 inch.
  2. Roll Size: 6 feet-6 inches by 75 feet 6 inches, nominal.
  3. Colors and Patterns: No. 908 "Dusty Grey WG".
  4. Product Standard: ASTM F1066.
  5. Wearing Surface: Smooth.
  6. Seamless-Installation Method: Manufacturer's standard.
  7. Application: Provide at Forestry Lab, Forestry Classroom, Technology Lab in Coaledo Hall; or as indicated on Drawings.
- C. Basis-of-Design Product, RF-3: iQ Eminent by Tarkett.
1. Thickness: 0.08 inch.
  2. Roll Size: 6 feet-6 inches by 75 feet 6 inches, nominal.
  3. Colors and Patterns: No. 870 "Dark Warm Grey WG".
  4. Product Standard: ASTM F1066.
  5. Wearing Surface: Smooth.
  6. Seamless-Installation Method: Manufacturer's standard.
  7. Application: Provide at Forestry Lab Prep. Room in Coaledo Hall; or as indicated on Drawings.
- D. Basis-of-Design Product, RF-4: iQ Granit by Tarkett.
1. Thickness: 0.08 inch.
  2. Roll Size: 6 feet-6 inches by 75 feet 6 inches, nominal.
  3. Colors and Patterns: No. 752 "Soft Sand Brown B".
  4. Product Standard: ASTM F1066.
  5. Wearing Surface: Smooth.
  6. Seamless-Installation Method: Manufacturer's standard.
  7. Application: Provide at Vestibules at hall in Coaledo Hall; or as indicated on Drawings.
- 2.4 TRANSITION STRIPS
- A. Metal Edge/ Transition Strips: Stainless steel and anodized aluminum extrusions, of profile and width shown, height to match tile and setting-bed thickness, and in maximum available lengths to minimize running joints.
1. Basis-of-Design Product, TRANS-9: SLT-XX-J by Tarkett; [www.commercial.tarkett.com](http://www.commercial.tarkett.com).
    - a. Material: Vinyl.
    - b. Finish and Color: As selected by Architect.

- c. Applications: Provide at transitions from resilient flooring to existing brick at Coaledo Hall.

## 2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturers for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
  - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. Cove Base Adhesives: 50 g/L.
    - b. Floor Adhesives: 60 g/L.
  - 2. Adhesive for Marmoleum Composite Sheet Flooring:
    - a. Basis-of-Design Product: Manufacturer's recommended adhesive for flooring types indicated.
- C. Seamless-Installation Accessories:
  - 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
    - a. Colors: Match floor tile, or as selected by Architect.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by flooring manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage while installing.
- B. Surface Preparation, General: Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- C. Substrate: Prepare substrate to be free of paint, old adhesive, sealers, coatings, finishes, dirt, film-forming curing compounds, and all other substances which may affect the adhesion of floor covering to the substrate.
- D. Wood Substrate: Per ASTM F1482, Wood subfloor/underlayment assemblies shall be double layer construction, with a total thickness of not less than 1 inch.
  - 1. There shall be minimum 18 inches of well-ventilated air space beneath all wood subfloors. Crawl spaces shall be insulated and protected by a moisture vapor barrier.

2. Do not install over "sleeper" underlayment systems or wood underlayment installed over concrete.
  3. Do not install over Lauan panels, CCA Plywood, Fire rated plywood, plywood with knots, underlayment made of pine or other soft woods, particle board, Oriented Strand Board (OSB) Masonite<sup>TM</sup> or other hardboard underlayment, hardwood flooring, textured or cushioned flooring, treated or otherwise coated wood material or other uneven or unstable substrates.
  4. Unacceptable surfaces shall be covered using a 1/4-inch or thicker panel underlayment.
  5. Wood Underlayments: Use only plywood underlayment that is warranted by the underlayment manufacturer for use as an underlayment for resilient floor covering in commercial applications. Do not use Lauan.
- E. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- F. Do not install floor coverings until they are same temperature as space where they are to be installed.
1. Move floor coverings and installation materials into spaces where they will be installed at least 72 hours in advance of installation.
- G. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.
- H. Do not install over existing floor covering nor over substrates not approved by manufacturer.

### 3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions for installing floor coverings.
- B. Install underlayment following underlayment manufacturer's written instructions.
- C. Unroll sheet flooring and allow it to stabilize before cutting and fitting.
- D. Lay out sheet flooring as follows:
1. Maintain uniformity of flooring direction.
  2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
  3. Match edges of flooring for color shading at seams.
  4. Avoid cross seams.
- E. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- F. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.
- G. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on subfloor. Use chalk or other nonpermanent marking device.
- H. Install floor coverings on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of floor covering installed on covers and adjoining floor covering. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.
- I. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

- J. Seamless Installation:
  - 1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
- K. Integral-Flash-Cove Base: Where indicated cove resilient sheet flooring to dimension indicated up vertical surfaces. Support flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip.

### 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing resilient product installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
    - a. Do not wash surfaces until after time period recommended by manufacturer.
- B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
- C. Floor Sealer, Polish, Sheet and Tile Goods: Remove soil, adhesive, and blemishes from flooring surfaces before applying liquid floor polish.
  - 1. Sealer: Apply two base coats of liquid sealer.
  - 2. Apply three coats of finish.
- D. Cover resilient flooring until Substantial Completion.

END OF SECTION



SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Resilient base (RB-1, RB-2 and RB-3).
  - 2. Metal edge/ transition strips (TRANS-1, TRANS-2, and TRANS-9).
  - 3. Installation accessories.
- B. Related Requirements:
  - 1. Section 09 30 00 "Tiling" for metal edge/ transition strips.
  - 2. Section 09 65 00 "Resilient Flooring" for resilient wall base and accessories installed with resilient flooring.
  - 3. Section 09 68 00 "Carpeting" for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: Manufacturer's samples for each product size and for each color.
- C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

- C. Install resilient products after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

### 2.2 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Roppe Corporation; [www.roppe.com](http://www.roppe.com).

### 2.3 RUBBER BASES

- A. Performance Requirements:
  - 1. Product Standard: Provide field formed corners for RB-1 and RB-2 with no pre-formed on inside and outside corners. Comply with ASTM F1861, Type TP (rubber, thermoplastic); group II (layered).
- B. Basis-of-Design Product, RB-1: Pinnacle 5-inch Rubber Wall Base by Roppe.
  - 1. Styles:
    - a. Standard toe at resilient flooring.
    - b. No toe at carpet tile.
  - 2. Height: 5 inches.
  - 3. Thickness: 1/8-inch.
  - 4. Colors: "Smoke".
  - 5. Application: Provide at wall base in areas of renovation for existing wall based to be removed and replaced in Sumner Hall; or as indicated in Drawings.
- C. Basis-of-Design Product, RB-2: Pinnacle 4-inch Rubber Wall Base by Roppe.
  - 1. Styles:
    - a. Standard toe at resilient flooring.
    - b. No toe at carpet tile.
  - 2. Height: 4 inches.
  - 3. Thickness: 1/8-inch.
  - 4. Colors: "Smoke".
  - 5. Application: Provide at wall base in Coaledo and Sumner Hall; or as indicated in Drawings.

### 2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
  - 1. Adhesives shall have a VOC content of 50 g/L or less.

## 2.5 RESILIENT FLOORING ACCESSORIES

### A. Transition Strips:

1. Vinyl, nominal 5/8 inches wide, 1/8 to 1/4 inch of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.
2. Basis-of-Design Manufacturers:
  - a. Tarkett, a division of Johnsonite; [www.commercial.tarkett.com](http://www.commercial.tarkett.com)
3. At Resilient Flooring to Carpet Tile, TRANS-1:
  - a. Basis-of-Design Product: SLT-XX-C by Tarkett.
    - 1) Finish Type: As selected by Architect.
    - 2) Size: 0.08 inch to 1/4 inch.
  - b. Applications: As indicated.
4. At Resilient Flooring to Existing Concrete, TRANS-2:
  - a. Basis-of-Design Product: SLT-XX-J by Tarkett.
    - 1) Finish Type: As selected by Architect.
    - 2) Size: 0.08 inch to subfloor.
  - b. Applications: As indicated.
5. At Resilient Flooring to Existing Brick at Door, TRANS-9:
  - a. Basis-of-Design Manufacturer: SSR-XX-B by Tarkett.
    - 1) Profile and Dimensions: As indicated.
    - 2) Finish Type: As selected by Architect.
    - 3) Applications: As indicated in Drawings in Coaledo Hall.
6. At Resilient Flooring to Existing Brick at Alcove, TRANS-9:
  - a. Basis-of-Design Manufacturer: SLT-XX-J by Tarkett.
    - 1) Profile and Dimensions: As indicated.
    - 2) Finish Type: As selected by Architect.
    - 3) Applications: As indicated in Drawings in Coaledo Hall.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
  1. Installation of resilient products indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
  - 4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until materials are the same temperature as space where they are to be installed.
  - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

### 3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required. Do not apply at concrete columns.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

### 3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.

### 3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.
  2. Sweep and vacuum horizontal surfaces thoroughly.
  3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

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SECTION 09 68 00 - CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Carpet tile (CPT-1, CPT-2, CPT-3, and CPT-4).
  - 2. Walk-off carpet (WOM-1).
  - 3. Transition trim.
- B. Related Requirements:
  - 1. Section 05 50 00 "Metal Fabrications" for metal edge trim recessed in concrete slab.
  - 2. Section 09 65 13 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
  - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. Shop Drawings: For carpet installation, plans showing the following:
  - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in laying carpet.
  - 2. Carpet type, color, and dye lot.
  - 3. Type of subfloor.
  - 4. Type of installation.
  - 5. Pattern of installation.
  - 6. Pattern type, location, and direction.
  - 7. Pile direction.
  - 8. Type, color, and location of insets and borders.
  - 9. Type, color, and location of edge, transition, and other accessory strips.
  - 10. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
  - 1. Carpet Tile: Full-size Sample.
  - 2. Exposed Edge, Transition, and Other Accessory Stripping: Manufacturer's Samples.
- D. Product Schedule: For carpet. Use same designations indicated on Drawings.

- E. Qualification Data: For Installer.
- F. Product Test Reports: For carpet, for tests performed by a qualified testing agency.
- G. Sample Warranty: For special warranty.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
  - 1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
  - 2. Precautions for cleaning materials and methods that could be detrimental to carpet.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Carpet: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association.
  - 1. Alternatively, Bidders may be considered appropriate for the Project by providing examples and references for three projects of similar scale and type to this Project, for review and approval by the Architect and Owner.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI's "CRI Carpet Installation Standard."

#### 1.8 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

#### 1.9 WARRANTY

- A. Special Warranty for Carpet: Manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
  - 1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
  - 2. Failures include, but are not limited to, the following:
    - a. More than 10 percent edge raveling, snags, and runs.
    - b. Dimensional instability.



- c. Excess static discharge.
  - d. Loss of tuft-bind strength.
  - e. Loss of face fiber.
  - f. Delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Appearance Retention Rating: Heavy traffic, 3.0b minimum according to ASTM D7330.
- B. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
- C. Dry Breaking Strength: Not less than 100 lbf according to ASTM D2646.
- D. Tuft Bind: Not less than 5 lbf according to ASTM D1335.
- E. Delamination: Not less than 3.5 lbf/in. according to ASTM D3936.
- F. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
- G. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
- H. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
- I. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
- J. Electrostatic Propensity: Less than 3.0 kV according to AATCC 134.
- K. Flammability: Class I.
- L. Smoke Density: Not less than 450 per ASTM E662.

### 2.2 MANUFACTURERS

- A. Basis-of-Design Manufacturers:
  - 1. Interface, Inc; [www.interface.com](http://www.interface.com).
  - 2. Vloer Commercial Flooring Systems; [www.vloercommercial.com](http://www.vloercommercial.com).

### 2.3 CARPET PRODUCTS, CPT 1, CPT 2, CPT 3

- A. Carpet Tile, CPT-1:
  - 1. Basis-of-Design Product: Model no. 148290AK0G, Ferris, Beaumont Range Collection by Interface.
    - a. Color: No. 107528 "Mushroom".
    - b. Size: 25 cm by 1 m.
    - c. Material: 100 percent Recycled Content Nylon.
    - d. Backing: Provide CQuest GB by Interface; or manufacturers recommendation as selected by Architect.
    - e. Installation Pattern: Ashlar.
    - f. Application: Provide at Lounge areas at Sumner Hall; or as indicated in Drawings.
- B. Carpet Tile, CPT-2:

1. Basis-of-Design Product: Model no. 131250AK00, Mesa, Beaumont Range Collection by Interface.
    - a. Color: No. 107520 "Fog".
    - b. Size: 25 cm by 1 m.
    - c. Material: 100 percent Recycled Content Nylon.
    - d. Backing: Provide CQuest GB by Interface; or manufacturers recommendation as selected by Architect.
    - e. Installation Pattern: Ashlar.
    - f. Application: Provide at Offices, Debrief, South Classrooms at Sumner Hall; or as indicated in Drawings.
  - C. Carpet Tile, CPT-3:
    1. Basis-of-Design Product: Model no. 131260AK0G, Eben, Beaumont Range Collection by Interface.
      - a. Color: No 107537 "Oak".
      - b. Size: 25 cm by 1 m.
      - c. Material: 100 percent Recycled Content Nylon.
      - d. Backing: Provide CQuest GB by Interface; or manufacturers recommendation as selected by Architect.
      - e. Installation Pattern: Ashlar.
      - f. Application: Provide at Lounge areas at Coaledo Hall; or as indicated in Drawings.
  - D. Carpet Tile, CPT-4:
    1. Basis-of-Design Product: Model no. 131250AK0G, Mesa, Beaumont Range Collection by Interface.
      - a. Color: No. 107515 "Fern".
      - b. Size: 25 cm by 1 m.
      - c. Material: 100 percent Recycled Content Nylon.
      - d. Backing: Provide CQuest GB by Interface; or manufacturers recommendation as selected by Architect.
      - e. Installation Pattern: Ashlar.
      - f. Application: Provide at Office Suite, Computer Science lab at Coaledo Hall; or as indicated in Drawings.
- 2.4 WALK-OFF CARPET TILE
- A. Walk-Off Carpet, WOM-1:
    1. Basis-of-Design Product: Uberchique Tile by Vloer Commercial Flooring Systems.
      - a. Color: "Black Shadow".
      - b. Size: 19.69 inches by 19.69 inches.
      - c. Thickness: As indicated.
      - d. Material: 100 percent Asota solution-dyed UV stabilized polypropylene fibers.
      - e. Backing: Premium composite rubber.

- f. Installation Pattern: As indicated in Drawings.
  - g. Installation: Manufacturer's standard.
- 2. Application: Provide at Vestibules at Coaledo Hall; or as indicated on Drawings.

## 2.5 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet, and are recommended by carpet manufacturer for releasable installation.
  - 1. Provide Tac-Tile adhesive for CPT-1, CPT-2, CPT-3, and CPT-4.
  - 2. Provide full spread of manufacturer's recommended adhesive for WOM-1.
- C. Transition Strips, TRANS-8:
  - 1. Basis-of-Design Product, TRANS-6: EG-XX-H edge guard by Tarkett.
    - a. Material: Vinyl.
    - b. Finish: As selected by Architect.
    - c. Applications: Provide at Coaledo Hall at carpet tiles to existing brick transitions.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance.
- B. Examine carpet for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
  - 1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb. of water/1000 sq. ft. in 24 hours.
    - b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
    - c. Perform additional moisture tests recommended in writing by adhesive and carpet manufacturers. Proceed with installation only after substrates pass testing.
    - d. Where necessary to reduce slab moisture for installation of carpet flooring, provide vapor emission control treatment acceptable to carpet manufacturer and compatible with products, and modify environmental conditions within acceptable range for specified Work and work sequence as required to maintain Project Schedule at no additional cost to the Owner.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. General: Comply with CRI's "Carpet Installation Standards" and with carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet.
- B. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet manufacturers.
  - 1. Grind high spots and fill low spots to produce a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.
  - 2. Finished concrete floor shall comply with requirements specified in this Section and in Section 03 30 00 "Cast-in-Place Concrete". Contractor, at no cost to Owner, shall provide corrective measures required to comply with floor level and flatness within acceptable limits specified.
  - 3. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Broom and vacuum clean substrates to be covered immediately before installing carpet.

### 3.3 INSTALLATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet manufacturer and indicated.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns indicated on Drawings and recommended in writing by carpet manufacturer.
- E. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- F. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.

### 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet:
  - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet manufacturer.
  - 2. Remove yarns that protrude from carpet surface.
  - 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

- C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

END OF SECTION

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SECTION 09 72 12 - FIBERGLASS REINFORCED PLASTIC WALL COVERING

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. Fiber reinforced plastic wall protection (FRP-1).
  - 2. Moldings and accessories.
- B. Related Requirements:
  - 1. Section 07 92 00 "Joint Sealants".
  - 2. Section 09 29 00 "Gypsum Board" for panel substrate.

1.3 SUBMITTALS

- A. Product Data: For each type of fiberglass reinforced plastic wall covering and accessory.
- B. Shop Drawings: Show location and extend of each wall covering. Indicate seams and termination points.
  - 1. Include trim types and locations and section details.
- C. Samples for Initial Selection: For each type of fiberglass reinforced plastic wall covering and accessory.
- D. Samples for Verification: For each type of wall covering and for each color, pattern, texture, and finish specified, 3 inches square in size.
- E. Product Schedule: For wall coverings. Use same designations indicated on Drawings.
- F. Qualification Data: For testing agency.
- G. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Applicator shall be experienced in manufacturer's installation procedures and be approved by the manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver finish materials to job site only when satisfactory conditions for storage can be provided. Maintain materials in manufacturer's labeled and unbroken packages.

1.7 PROJECT CONDITIONS

- A. Acclimate plastic sheet at least 24 hours in temperature and humidity conditions of final environment before beginning Work of this Section.

- B. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Flame-Spread Index: 25 or less.
    - b. Smoke-Developed Index: 50 or less.

### 2.2 FIBERGLASS REINFORCED PLASTIC PANELS, FRP-1

- A. Basis-of-Design Product: Glas-bord wall panel by Crane Composites; [www.cranecomposites.com](http://www.cranecomposites.com).
  - 1. Fiberglass reinforced plastic sheet; 0.075-inch thick.
  - 2. Size: As indicated on Drawings.
  - 3. Fire Hazard Classification: Class A, as tested per ASTM E84.
  - 4. Color: No. 85 "White".
  - 5. Texture: Smooth.
- B. Application: As indicated on Drawings.
- C. Adhesive: Low VOC as recommended by plastic sheet manufacturer for laminating over gypsum board substrate.
- D. Sealant: Silicone sealant as recommended by plastic sheet manufacturer for sealing edges and installing moldings.
- E. Moldings:
  - 1. Material: PVC in matching color.
  - 2. Manufacturer: By panel manufacturer.
  - 3. Profiles: As selected by Architect for panel splices, inside and outside corners, bottom, top and edge of panel from manufacturer's standard profiles.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions:
  - 1. Verify that all surfaces are smooth, level, clean, and free of irregularities that may be detrimental to proper application.
  - 2. Commencement of installation denotes acceptance of substrate.
  - 3. Do not begin installation until the work of all other trades, including painting, has been completed and the temperature of the rooms has been maintained within humidity and



temperature requirements by adhesive manufacturer for at least 48 hours before commencing Work.

3.2 INSTALLATION

- A. Apply adhesive in accordance with the recommendations of the adhesive manufacturer.
- B. Handle and install wall covering in conformance with manufacturer's installation bulletin.
- C. Install wall covering to provide a proper symmetrical pattern in each area, with joints straight and true, and all panel edges concealed with appropriate molding for finished appearance; joints sealed with silicone sealant.

3.3 CLEANING AND PROTECTION

- A. Carefully clean all surfaces after application using recommended methods. Any stains or defects apparent after cleaning will require replacement of material.
- B. Protect wall coverings from damage. Replace damage coverings.

END OF SECTION

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## SECTION 09 84 33 - SOUND-ABSORBING WALL PANELS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Acoustic wall panel (AWP-1).
  - 2. Sound absorbing cork wall panel (AWP-2).
  - 3. Acoustical ceiling baffle (AB-1, AB-2).
- B. Related Requirements:
  - 1. Section 05 55 00 "Metal Fabrications" for coordination of metal supports and accessories.
  - 2. Section 06 10 00 "Rough Carpentry" for blocking and supports for acoustical panel units.
  - 3. Section 09 22 16 "Non-Structural Metal Framing" for substrate framing and blocking.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of panel edge, core material, and mounting indicated.
- B. Shop Drawings: For acoustical wall panels.
  - 1. Include plans, elevations, sections, and mounting devices and details.
  - 2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge profile and core materials.
  - 3. Include details at cutouts and penetrations for other work.
  - 4. Include direction of fabric weave and pattern matching.
- C. Coordination Drawings: Show intersections with wall base, shelves, countertops, drawers, doors, chalk rails, electrical outlets and switches, thermostats, lighting fixtures, air outlets and inlets, speakers, sprinklers, access panels, and other adjacent work. Show operation of casework doors and drawers and doors.
- D. Samples for Initial Selection: For each type of fabric facing material from acoustical wall panel manufacturer's full range.
  - 1. Sample Panels: No larger than 1 by 1 foot. Show joints and mounting methods.
  - 2. Fabric: Provide samples as recommended by manufacturer's memo for the following.
    - a. Acoustic wall panel (AWP-2).
- E. Product Certificates: For each type of acoustical wall panel, signed by product manufacturer.
- F. Maintenance Data: For acoustical wall panels to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal recommendations.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing acoustical wall panels similar to those indicated for this Project and with a record of successful in-service performance.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical wall panels from excessive moisture when shipping, storing, and handling. Deliver in unopened bundles and store in a dry place with adequate air circulation. Do not deliver material to building until wet-work, such as concrete and plaster, has been completed and cured to a condition of equilibrium. Protect panel edges from crushing and impact.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical wall panels until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Air-Quality Limitations: Protect acoustical wall panels from exposure to airborne odors, such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.
- C. Field Measurements: Verify wall surface dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
  - 1. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Flame-Spread Index: 25 or less.
    - b. Smoke-Developed Index: 450 or less.
  - 2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.
- B. Low-emitting materials: All materials and products used on the interior of the building (i.e., inside of the weatherproofing system and applied on-site) shall meet the following standards:
  - 1. Adhesive, sealants and sealant primers shall not exceed the volatile organic content (VOC) limits defined by the current version of South Coast Air Quality Management District (SCAQMD) Rule 1168.

2.2 ACOUSTIC WALL PANELS, AWP-1

- A. Sound-Absorbing Wall Panel, AWP-1: Manufacturer's standard panel construction consisting of facing material stretched over front face of edge-framed core and bonded to edges and back of frame. See drawings for installation location and number of panels.
  - 1. Basis-of-Design Product: Fabric wrapped, Acoustical, Tackable Panel by FabriTACK; [www.fabritrak.com](http://www.fabritrak.com).
    - a. Mounting: Back mounted with manufacturer's standard Z-clip hanger system at back of panels, secured to substrate.
    - b. Core: Manufacturer's standard medium density fiberglass board.
      - 1) Core-Face Layer: Manufacturer's standard tackable, impact-resistant, high-density fiberglass board.

- c. Edge Construction: Manufacturer's standard chemically hardened core with no frame.
  - d. Edge Profile: 1 inch Square; or as indicated on Drawings.
  - e. Corner Detail in Elevation: Custom as indicated on Drawings with continuous edge profile indicated.
  - f. Reveals between Panels: As indicated on Drawings.
  - g. NRC Rating: No less than 0.80.
  - h. Fabric Finish: Maharam.
  - i. Color: "Rhea".
  - j. Acoustical Performance: Sound absorption NRC of not less than 0.80 according to ASTM C423 for Type A mounting according to ASTM E795.
  - k. Nominal Thickness: 1-1/8 inch.
  - l. Panel Width: As indicated on Drawings.
  - m. Panel Height: As indicated on Drawings.
2. Applications: Provide at Sumner Hall Debrief Room; or as indicated on Drawings.

2.3 SOUND-ABSORBING WALL PANEL, AWP-2:

- A. Sound-Absorbing Wall Panel, AWP-2: Manufacturer's standard cork panels. See drawings for installation location and number of panels.
- 1. Basis-of-Design Product: Muratto Organic Strips: STEP, cork panels by Sustainable Materials; [www.sustainablematerials.com](http://www.sustainablematerials.com).
    - a. Mounting: Back mounted with manufacturer's standard Z-clip hanger system at back of panels, secured to substrate.
    - b. Materials: Made from 100% reclaimed, rapidly renewable cork.
    - c. Edge Profile: 1 inch Square; or as indicated on Drawings.
    - d. Reveals between Panels: As indicated on Drawings.
    - e. Fabric Finish: As selected by Architect.
    - f. Color: "Taupe".
    - g. Acoustical Performance: Sound absorption NRC of not less than 0.30.
    - h. Nominal Thickness: 1/2 inch.
    - i. Panel Width: 27 inches.
    - j. Panel Height: 19 inches.
  - 2. Applications: Provide at Meeting Room at Coaledo; as indicated on Drawings.

2.4 ACOUSTICAL CEILING BAFFLE

- A. Sound-Absorbing Ceiling Baffle, AB-1:
- 1. Basis-of-Design Product/ Manufacturer: Torrent Acoustical Ceiling Baffle by Turf Design, Inc; [www.turf.design.com](http://www.turf.design.com).
  - 2. Material: Up to 60 percent Pre-Consumer Recycled Content Polyester Felt.
  - 3. Dimensions: As selected by Architect and indicated in Drawings.
  - 4. Nominal Thickness: 1 inch.

5. NRC Rating: No less than 0.85.
6. Layout: As indicated in Drawings.
7. Color: No. 26 "Faded Denim".
8. Suspension Systems: As recommended by manufacturer.
9. Application: Provide at Sumner Hall; as indicated in Drawings.

B. Sound-Absorbing Ceiling Baffle, AB-2:

1. Basis-of-Design Product/ Manufacturer: Plate Acoustical Ceiling Baffle by Turf Design, Inc; [www.turf.design.com](http://www.turf.design.com).
2. Material: Up to 60 percent Pre-Consumer Recycled Content Polyester Felt.
3. Dimensions: As selected by Architect and indicated in Drawings.
4. Nominal Thickness: 2 inches.
5. NRC Rating: 1.10.
6. Layout: As indicated in Drawings.
7. Color: No. 11 "Celadon".
8. Suspension Systems: As recommended by manufacturer.
9. Application: Provide at Coaledo Hall; as indicated in Drawings.

2.5 FABRICATION

- A. Fabricate panels to sizes and configurations indicated; attach facing materials to cores to produce installed panels with visible surfaces fully covered and free from waves in fabric weave, wrinkles, sags, blisters, seams, adhesive, or other foreign matter.
1. Fabricate back-mounted panels in factory to exact sizes required to fit wall surfaces, based on field measurements of completed substrates indicated to receive acoustical wall panels.
  2. Where square corners are indicated, tailor corners.
  3. Where fabrics with directional or repeating patterns, or directional weave, are indicated, mark fabric top and attach fabric in same direction.
  4. Where fabric facings with seams are indicated, fabricate invisible seams and comply with Shop Drawings for location.
- B. Dimensional Tolerances of Finished Units: Plus or minus 1.6 mm for the following:
1. Thickness.
  2. Edge straightness.
  3. Overall length and width.
  4. Squareness from corner to corner.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and blocking, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting acoustical wall panel performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install acoustical wall panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, and scribed to fit adjoining work accurately at borders and at penetrations. Comply with panel manufacturer's written instructions for installation of panels using type of mounting accessories indicated or, if not indicated, as recommended by manufacturer.
  - 1. See elevations for panel sizes. Scribe acoustical wall panels to fit adjacent work. Butt joints tightly.
- B. Construction Tolerances: As follows:
  - 1. Variation from Plumb and Level: Plus or minus 1/16 inch.
  - 2. Variation of Joints from Hairline: Not more than 1/16 inch.

### 3.3 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels with fabric facing, on completion of installation, to remove dust and other foreign materials according to manufacturer's written instructions.
- C. Remove surplus materials, rubbish, and debris resulting from acoustical wall panel installation, on completion of the Work, and leave areas of installation in a neat and clean condition.

### 3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure acoustical wall panels are without damage or deterioration at time of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired, in a manner approved by Owner's representative, before time of Substantial Completion.

END OF SECTION

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SECTION 09 91 00 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and field painting of exposed items and surfaces, except as indicated in the Related Requirements articles below.
  - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections. Substrates include:
    - a. Interior Substrates:
      - 1) Interior gypsum board ceilings and soffits.
      - 2) Interior gypsum board walls.
      - 3) Interior floor finish.
      - 4) Interior doors, door frames, and corner trim.
      - 5) Gypsum board walls where indicated or required to be epoxy.
  - 2. Paint schedule for all finish colors in Project.
- B. Related Requirements:
  - 1. Section 09 96 00 "High Performance Coatings" for exterior finishes and for interior painting of powder-coated substrates.
- C. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
  - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
  - 1. Prefinished items include the following factory-finished components:
    - a. Finished mechanical and electrical equipment.
    - b. Light fixtures.
  - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
    - a. Foundation spaces.
    - b. Furred areas.
    - c. Ceiling plenums.
    - d. Utility tunnels.
    - e. Pipe spaces.
    - f. Duct shafts.

3. Finished metal surfaces include the following:
    - a. Anodized aluminum.
    - b. Stainless steel.
    - c. Chromium plate.
    - d. Copper and copper alloys.
    - e. Bronze and brass.
  4. Operating parts include moving parts of operating equipment and the following:
    - a. Valve and damper operators.
    - b. Linkages.
    - c. Sensing devices.
    - d. Motor and fan shafts.
  5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- E. Products and materials in this Section have been selected for indoor chemical and pollutant source control and/ or low-VOC emitting characteristics.

### 1.3 DEFINITIONS

- A. Volatile Organic Compounds (VOCs): Compounds as defined by the U.S. Environmental Protection Agency (EPA) in 40 CFR § 51.100 (s), (1).
- B. Anti-Corrosive Paints: Coatings formulated and recommended for use in preventing the corrosion of ferrous metal substrates.

### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
  1. Submit Samples on rigid backing, 8 by 10 inches square.
  2. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
  1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
  2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

### 1.5 PROJECT CONDITIONS

- A. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
- B. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 95 deg F.
- C. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.

- D. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 38 deg F above the dew point; or to damp or wet surfaces.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Volatile Organic Compounds (VOCs): Provide paint products of zero VOCs or low VOCs for all interior surfaces, when available.

### 2.2 MANUFACTURERS

- A. Preferred, Local/ Regional Manufacturers:
  - 1. Sherwin-Williams Company (The); [www.sherwin-williams.com](http://www.sherwin-williams.com).

### 2.3 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with 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 paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- C. Chemical Components of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions.
  - 1. The following chemicals shall not be used as an ingredient in any of the paints or coatings applied indoors and on-site:
    - a. Aromatic Compounds: The product must contain no more than 1.0 percent by weight of the sum total of aromatic compounds.
    - b. Halomethanes: Methylene Chloride.
    - c. Chlorinated Ethanes: 1,1,1-trichloroethane.
    - d. Aromatic Solvents: Benzene, Toluene (methylbenzene), Ethylbenzene.
    - e. Chlorinated Ethylenes: Vinyl Chloride.
    - f. Polynuclear Aromatics: Naphthalene.
    - g. Chlorobenzenes: 1,2-dichlorobenzene.
    - h. Phthalate Esters: di (2-ethylhexyl) phthalate, butyl benzyl phthalate, di-n-butyl phthalate, di-n-octyl phthalate, diethyl phthalate, dimethyl phthalate.
    - i. Miscellaneous Semi-Volatile Organics: Isophorone. Metals and their compounds: Antimony, Cadmium, Hexavalent Chromium, Lead, Mercury.
    - j. Preservatives (Anti-Fouling Agents): Formaldehyde.
    - k. Ketones: Methyl ethyl ketone, Methyl isobutyl Ketone.
    - l. Miscellaneous Volatile Organics: Acrolein, Acrylonitrile.
  - 2. Volatile Organic Compounds: The volatile organic compound (VOC) concentrations (in grams per liter) of the paint or coating shall not exceed those listed below if the paint or coating is applied indoors, on-site. VOCs shall be tested in accordance with the U.S.

Environmental Protection Agency (EPA) Test Method 24. The calculation of VOC shall exclude water, exempt solvents, and tinting color added at the point of sale.

- a. Flat Interior Coatings: Provide paint products of zero VOCs or low VOCs for all interior surfaces, when available; 50 g/L maximum.
- b. Non-Flat Interior Coatings: Provide paint products of zero VOCs or low VOCs for all interior surfaces, when available; 150 g/L maximum.
- c. Gloss Anti-Corrosive Interior Coatings: Provide paint products of zero VOCs or low VOCs for all interior surfaces, when available; 250 g/L maximum.
- d. Semi-Gloss Anti-Corrosive Interior Coatings: Provide paint products of zero VOCs or low VOCs for all interior surfaces, when available; 250 g/L maximum.
- e. Flat Anti-Corrosive Interior Coatings: Provide paint products of zero VOCs or low VOCs for all interior surfaces, when available; 250 g/L maximum.
- f. Bond Breaker Coatings: 350 g/L.
- g. Concrete Curing Compounds: 350 g/L.
- h. Floor Coatings: 250 g/L.
- i. Flow Coatings: 420 g/L.
- j. Form Release Compounds: 250 g/L.
- k. Pre-Treatment Wash Primers Coatings: 420 g/L.
- l. Sanding Sealers (Non-Lacquer): 350 g/L.
- m. Shellacs, Clear: 730 g/L.
- n. Shellacs, Opaque: 550 g/L.
- o. Specialty Primers, Sealers, and Undercoaters: 350 g/L.
- p. Stains: 250 g/L.
- q. Varnishes: 350 g/L.
- r. Waterproofing Sealers: 250 g/L.
- s. Waterproofing Sealers, Concrete/Masonry: 400 g/L.
- t. Wood Preservatives: 350 g/L.

#### 2.4 PREPARATORY COATS

- A. Concrete Unit Masonry Block Filler: High-performance latex block filler of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.
- B. Interior Primer: Interior latex-based or alkyd primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.
  1. Ferrous-Metal Substrates: Quick drying, rust-inhibitive metal primer.
  2. Zinc-Coated Metal Substrates: Galvanized metal primer.
  3. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

#### 2.5 INTERIOR FINISH COATS

- A. Interior Acrylic Paint: Zero VOC per EPA Method 24; Master Painters Institute (MPI) no. 53.

1. Provide product free of ingredients listed in the Living Building Challenge (LBC) Red List by International Living Future Institute; [www.living-future.org](http://www.living-future.org).
  2. Basis-of-Design Product: SuperPaint Interior Acrylic Latex by Sherwin Williams.
    - a. Product's manufacturer provides the following documentation; substitution products without the same documentation will not be considered:
      - 1) Environmental Product Declaration (EPD).
      - 2) Health Product Declaration (HPD).
      - 3) Declare label.
    - b. Certifications:
      - 1) Cradle-to-Cradle (C2C Silver).
  3. Applications: Interior gypsum board ceilings and soffits.
- B. Interior Acrylic Paint: Zero VOC per EPA Method 24; Master Painters Institute (MPI) no. 52.
1. Provide product free of ingredients listed in the Living Building Challenge (LBC) Red List by International Living Future Institute; [www.living-future.org](http://www.living-future.org).
  2. Interior Vapor Retarder Primer:
    - a. Approved Products:
      - 1) Acrylitex Vapor Prime by Acrylic Technologies, Inc.; [www.acrylitex.com](http://www.acrylitex.com).
      - 2) No. B72W00001 Moisture Vapor Barrier Interior Latex Primer by Sherwin Williams.
    - b. Applications: Interior face of exterior walls at gypsum board and existing plaster finishes.
  3. Basis-of-Design Product: Interior Latex Eggshell Enamel by Sherwin Williams.
    - a. Product's manufacturer provides the following documentation; substitution products without the same documentation will not be considered:
      - 1) Environmental Product Declaration (EPD).
      - 2) Health Product Declaration (HPD).
      - 3) Declare label.
    - b. Certifications:
      - 1) Cradle-to-Cradle (C2C Silver).
  4. Applications: Interior gypsum board walls.
- C. Interior Acrylic Paint: Zero VOC per EPA Method 24; Master Painters Institute (MPI) no. 43.
1. Provide product free of ingredients listed in the Living Building Challenge (LBC) Red List by International Living Future Institute; [www.living-future.org](http://www.living-future.org).
  2. Basis-of-Design Product: SUPERPAINT Semi-Gloss Interior Paint by Sherwin Williams.
    - a. Product's manufacturer provides the following documentation; substitution products without the same documentation will not be considered:
      - 1) Environmental Product Declaration (EPD).
      - 2) Health Product Declaration (HPD).
      - 3) Declare label.
    - b. Certifications:

- 1) Cradle-to-Cradle (C2C Silver).
3. Applications: Interior doors, door frames, and corner trim.
- D. Water-Borne Epoxy System, P#E: Single-component, non-catalyst; low VOC; water cleanup.
  1. Provide product free of ingredients listed in the Living Building Challenge (LBC) Red List by International Living Future Institute; [www.living-future.org](http://www.living-future.org).
  2. Primer: As applicable to intermediate coat and topcoat.
  3. Intermediate Coat: Epoxy, matching topcoat.
  4. Topcoat: Epoxy, eggshell.
    - a. Basis-of-Design Product: Pro Industrial Water Based Catalyzed Epoxy, Eggshell by Sherwin Williams.
  5. Application: Gypsum board walls where indicated or required to be epoxy.

## 2.6 COLOR SCHEDULE

- A. Manufacturers indicated serve as basis-of-design for color matching purposes.

P#	BASIS-OF-COLOR MANUF'R	COLOR	SHEEN
P-1	Sherwin Williams	"Pure White."	Eggshell; or as indicated for substrate and application.
P-2	Sherwin Williams	"High Reflective White".	Flat; or as indicated for substrate and application.
P-3	Sherwin Williams	"Debonair".	Eggshell; or as indicated for substrate and application.
P-4	Sherwin Williams	"Green Onyx".	Eggshell; or as indicated for substrate and application.
P-5	Sherwin Williams	"Iron Ore".	Flat; or as indicated for substrate and application.
P-10	Sherwin Williams	"Mindful Gray".	Semi-gloss; or as indicated for substrate and application.
P-15	Sherwin Williams	As select by Architect.	As indicated for substrate and application.
P-16	Sherwin Williams	As select by Architect.	As indicated for substrate and application.
EP-1	Sherwin Williams	To match P-1.	Eggshell; or as indicated for substrate and application.
EP-3	Sherwin Williams	To match P-3.	Eggshell; or as indicated for substrate and application.

## PART 3 - EXECUTION

### 3.1 APPLICATION

- A. Comply and coordinate with Room Finish Schedule and Drawings for location and application of paint colors (P-#).

- B. Comply with procedures specified in PDCA P4 for inspection and acceptance of surfaces to be painted.
- C. 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.
- D. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- E. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
  - 1. Provide barrier coats over incompatible primers or remove and reprime.
  - 2. Cementitious Materials: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
  - 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 that comply with SSPC's recommendations.
    - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3, SSPC-SP 10/NACE No. 2.
    - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
  - 4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- F. Material Preparation:
  - 1. Maintain containers used in mixing and applying paint in a 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. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
- G. Exposed Surfaces: Include areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
  - 1. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment, furniture with prime coat only, and painted walls behind acoustical/ tack panels.
  - 2. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
  - 3. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

4. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
  - H. Sand lightly between each succeeding enamel or varnish coat.
  - I. 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. Omit primer over metal surfaces that have been shop primed and touchup painted.
    2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.
  - J. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
  - K. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.
  - L. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
  - M. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
  - N. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
  - O. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
  - P. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.
- 3.2 CLEANING AND PROTECTING
- A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
  - B. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
  - C. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
    1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

END OF SECTION



SECTION 09 96 00 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and field application of high-performance coating systems.
  - 1. Section includes surface preparation and the application of high-performance coating systems on the following substrates:
    - a. Exterior Substrates:
      - 1) Cast-in-place concrete.
      - 2) Galvanized ferrous metal.
      - 3) Non-galvanized, unprimed steel and hollow-metal work.
      - 4) Nonferrous Metal, including non-anodized aluminum.
      - 5) Wood.
      - 6) Existing unit ventilators (P-11).
      - 7) Preservative-treated wood.
    - b. Interior Substrates:
      - 1) Non-galvanized, unprimed steel and hollow-metal work.
      - 2) Aluminum (not anodized or otherwise coated).
      - 3) Gypsum board indicated to receive epoxy finish.
      - 4) Wood indicated to receive epoxy finish.
- B. Products and materials in this Section have been selected for indoor chemical and pollutant source control and/ or low-VOC emitting characteristics.
- C. Related Requirements:
  - 1. Section 09 91 00 "Painting" for surface preparation and field painting of exposed interior and exterior items and surfaces, except as indicated in the Summary articles of this Section.
- D. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface as selected by Architect. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
  - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

- E. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
  - 1. Prefinished items include the following factory- and shop-finished components:
    - a. Finish carpentry.
    - b. Architectural casework.
    - c. Mechanical and electrical equipment.
    - d. Lighting fixtures.
  - 2. Prefinished metal surfaces include the following:
    - a. Anodized aluminum.
    - b. Stainless steel.
    - c. Chromium plate.
    - d. Copper and copper alloys.
    - e. Bronze and brass.
  - 3. Operating parts include moving parts of operating equipment and the following:
    - a. Valve and damper operators.
    - b. Linkages.
    - c. Sensing devices.
    - d. Motor and fan shafts.
  - 4. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
    - a. Furred areas.
    - b. Ceiling plenums.
    - c. Piping spaces.
    - d. Duct shafts.
  - 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- F. Products and materials in this Section have been selected for indoor chemical and pollutant source control and/ or low-VOC emitting characteristics.

### 1.3 DEFINITIONS

- A. Volatile Organic Compounds (VOCs): Compounds as defined by the U.S. Environmental Protection Agency (EPA) in 40 CFR § 51.100 (s), (1).
- B. Anti-Corrosive Paints: Coatings formulated and recommended for use in preventing the corrosion of ferrous metal substrates.
- C. Standard coating terms defined in ASTM D 16 apply to this Section.
- D. Gloss ranges used in this Section include the following:
  - 1. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
  - 2. High gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

- E. Environments: The following terms are used in Part 2 of this Section to distinguish between different corrosive exposures:
1. "Severe environments" are highly corrosive industrial atmospheres with sustained exposure to high humidity and condensation and with frequent cleaning using strong chemicals. Environments with heavy concentrations of strong chemical fumes and frequent splashing and spilling of harsh chemical products are severe environments.
  2. "Moderate environments" are corrosive industrial atmospheres with intermittent exposure to high humidity and condensation, occasional mold and mildew development, and regular cleaning with strong chemicals. Environments with exposure to heavy concentrations of chemical fumes and occasional splashing and spilling of chemical products are moderate environments.
  3. "Mild environments" are industrial atmospheres with normal exposure to moderate humidity and condensation, occasional mold and mildew development, and infrequent cleaning with strong chemicals. Environments with low levels of mild chemical fumes and occasional splashing and spilling of chemical products are mild environments. Normal outdoor weathering is also considered a mild environment.

#### 1.4 SEQUENCING AND SCHEDULING

- A. Perform maintenance repainting in the following sequence, which includes work specified in this and other Sections:
1. Dismantle existing surface-mounted objects and hardware except items indicated to remain in place. Tag items with location identification and protect.
  2. Verify that temporary protections have been installed.
  3. Examine condition of surfaces to be painted.
  4. Remove existing paint to the degree required for each substrate and surface condition of existing paint.
  5. Apply paint system.
  6. Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.

#### 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of finish-coat product indicated.
- C. Samples for Verification: For each type of coating system and in each color and gloss of finish coat indicated.
1. Submit Samples on rigid backing, 8 by 10 inches square.
  2. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
  2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

#### 1.7 QUALITY ASSURANCE

- A. All materials, preparation and painting Work shall comply with the requirements of the latest edition of the Architectural Painting Specification Manual by the Master Painters Institute (MPI).
  1. All paint manufacturers and products shall be listed under the Approved Product List section of the MPI Painting Manual.
- B. Color Matching: Custom computer-match paint colors to colors scheduled.
- C. Applicator Qualifications: Engage an experienced applicator who has completed high-performance coating system applications similar in material and extent to those indicated for Project and whose work has a record of successful in-service performance.
- D. Source Limitations: Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label with the following information:
  1. Name or title of material.
  2. Product description (generic classification or binder type).
  3. Manufacturer's stock number and date of manufacture.
  4. Contents by volume, for pigment and vehicle constituents.
  5. Thinning instructions.
  6. Application instructions.
  7. Color name and number.
  8. Handling instructions and precautions.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 7 deg C. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
  1. Protect materials from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and applying coatings.

#### 1.9 PROJECT CONDITIONS

- A. Exterior:
  1. Apply paints, including waterborne paints, only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
  2. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
  3. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
    - a. Allow wet surfaces to dry thoroughly and attain temperature and conditions specified before proceeding with or continuing coating operation.

- b. Work may continue during inclement weather only if areas and surfaces to be coated are enclosed and temperature within the area can be maintained within limits specified by manufacturer during application and drying periods.
- B. Interior:
  - 1. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
  - 2. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Interior Paints: Emissions testing must comply with California Department of Public Health (CDPH) Standard Method v1.1–2010.

### 2.2 MANUFACTURERS

- A. Preferred Local Manufacturers:
  - 1. Sherwin-Williams Co., The; [www.sherwin-williams.com](http://www.sherwin-williams.com).

### 2.3 COATINGS MATERIALS, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated, including gloss levels, and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
  - 1. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. Epoxy resin coatings shall be used where surfaces to be coated require high corrosion resistance, chemical resistance, bond strength, UV resistance and toughness.
- D. Polyurethane-base coatings shall be used where surfaces to be coated require high corrosion resistance, chemical resistance, good flexibility and chemical resistance, UV resistance, and must be a two-part, prepolymer, catalytic-cured resin material.
- E. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- F. Chemical Components of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions.
  - 1. The following chemicals shall not be used as an ingredient in any of the paints or coatings applied indoors and on-site:
    - a. Aromatic Compounds: The product must contain no more than 1.0% by weight of the sum total of aromatic compounds.
    - b. Halomethanes: Methylene Chloride.
    - c. Chlorinated Ethanes: 1,1,1-trichloroethane.
    - d. Aromatic Solvents: Benzene, Toluene (methylbenzene), Ethylbenzene.

- e. Chlorinated Ethylenes: Vinyl Chloride.
  - f. Polynuclear Aromatics: Naphthalene.
  - g. Chlorobenzenes: 1,2-dichlorobenzene.
  - h. Phthalate Esters: di (2-ethylhexyl) phthalate, butyl benzyl phthalate, di-n-butyl phthalate, di-n-octyl phthalate, diethyl phthalate, dimethyl phthalate.
  - i. Miscellaneous Semi-Volatile Organics: Isophorone. Metals and their compounds: Antimony, Cadmium, Hexavalent Chromium, Lead, Mercury.
  - j. Preservatives (Anti-Fouling Agents): Formaldehyde.
  - k. Ketones: Methyl ethyl ketone, Methyl isobutyl Ketone.
  - l. Miscellaneous Volatile Organics: Acrolein, Acrylonitrile.
2. Volatile Organic Compounds: The volatile organic compound (VOC) concentrations (in grams per liter) of the paint or coating shall not exceed those listed below if the paint or coating is applied indoors, on-site. VOCs shall be tested in accordance with the U.S. Environmental Protection Agency (EPA) Test Method 24. The calculation of VOC shall exclude water, exempt solvents, and tinting color added at the point of sale.
- a. Flat Interior Coatings: 50 g/L.
  - b. Non-Flat Interior Coatings: 150 g/L.
  - c. Gloss Anti-Corrosive Interior Coatings: 250 g/L.
  - d. Semi-Gloss Anti-Corrosive Interior Coatings: 250 g/L.
  - e. Flat Anti-Corrosive Interior Coatings: 250 g/L.
  - f. Floor Coatings: 250 g/L.
  - g. Flow Coatings: 420 g/L.
  - h. Pre-Treatment Wash Primers Coatings: 420 g/L.
  - i. Sanding Sealers (Non-Lacquer): 350 g/L.
  - j. Specialty Primers, Sealers, and Undercoats: 350 g/L.
- G. Transition Coat: Paint manufacturer's recommended coating for use where a residual existing coating is incompatible with the paint system.
- 2.4 EXTERIOR HIGH-PERFORMANCE COATING SYSTEMS
- A. Cast-in-Place Concrete: At existing and new concrete and other cementitious finishes scheduled to be painted or coated.
1. Surface Preparation: All concrete scheduled for repair and new coatings.
- a. Chemical Pretreatment: Apply cleaner and let penetrate and rest for duration recommended by manufacturer. Remove soluble contaminants.
    - 1) Cleaner: Non-sudsing biodegradable paint remover and cleaner: Krud Kutter or similar.
  - b. Pressure Blasting: 150 deg F, 5.0 GPM, 2500 psi, 20 degree and a turbo tip kept within 4 to 6 inches of surface.
    - 1) Remove 98 percent of existing paint.
  - c. Rinse thoroughly.
  - d. Inspect and repair concrete as required prior to application of coating.

2. System:
  - a. Sealer: SW Loxon Sealer/Primer A24W8300 by Sherwin Williams; field-applied at 2.1 to 3.0 MDFT.
  - b. Sealant: SW Loxon H1 Hybrid Sealant by Sherwin Williams, for cracks.
  - c. First Coat: SW Loxon XP A24-1400 by Sherwin Williams; field-applied at 6.0 to 8.0 MDFT.
  - d. Second Coat: SW Loxon LX21-50 Satin by Sherwin Williams; field-applied at 6.0 to 8.0 MDFT.
- B. Galvanized Ferrous Metal: Provide the following finish system over exterior ferrous-metal surfaces:
  1. Semigloss Finish: One finish coat over an intermediate coat and a primer.
    - a. Primer: Epoxy primer applied at spreading rate recommended.
    - b. Intermediate Coat: Epoxy applied at spreading rate recommended to achieve a dry film thickness of 3 to 5 mils (0.076 to 0.127 mm).
    - c. Intermediate Coat: Aliphatic polyurethane enamel applied at spreading rate recommended to achieve a dry film thickness of 1.5 to 4 mils (0.038 to 0.102 mm).
    - d. Topcoat: Aliphatic polyurethane enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 1.5 to 4 mils (0.038 to 0.102 mm).
- C. Non-Galvanized, Unprimed Steel and Hollow Metal Work: Provide the following urethane, 3-Coat finish systems over exterior ferrous-metal surfaces, including structural steel at canopies and other locations:
  1. Surface Preparation: SSPC-SP6.
  2. Primer: Aromatic polyurethane, mio-zinc filled primer:
    - a. Product: Series 394 PerimePrime by Tnemec; 330 g/L VOCs; shop-apply at 2.5 to 3.5 mils DFT.
    - b. Where a primer other than that specified has been applied, fully apply specified primer to all surfaces at the 3 mils DFT as a tie-coat for succeeding applications.
  3. Spot Primer: Same as primer; apply at 2.5 to 3.5 mils DFT.
  4. First field coat, 2-part polyamide epoxy coating:
    - a. Product: Series 27 F.C. Typoxy by Tnemec; 282 g/L VOCs; shop- or field-apply at 2 to 6 mils DFT.
  5. Second Field Coat: 2-part polyfunctional hybrid urethane coating; semi-gloss finish:
    - a. Product: Series 750 UVX by Tnemec; 99 g/L VOCs; shop- or field-apply at 2.5 to 5 mils DFT.
  6. Alternate Second Field Coat: 2-part aliphatic acrylic polyurethane coating; semi-gloss finish:
    - a. Series 73 Endura-Shield by Tnemec; 325 g/L VOCs; shop- or field-apply at 2 to 5 mils DFT.
  7. Total dry-field thickness: No less than 8 mils DFT of field-applied coating.
  8. Touchup, aromatic polyurethane, mio-zinc filled primer:
    - a. Where shop-applied primer has been damaged or abraded, shop- or field-repairs shall consist of surface preparation by SSPC-SP6 followed by application of specified primer to bare surfaces.

- D. Nonferrous Metal: Provide the following finish system over exterior nonferrous-metal surfaces:
1. Semigloss Finish: One finish coat over an intermediate coat and a primer.
    - a. Primer: Epoxy primer applied at spreading rate recommended.
    - b. Intermediate Coat: Epoxy applied at spreading rate recommended to achieve a dry film thickness of 3 to 8 mils (0.076 to 0.203 mm).
    - c. Intermediate Coat: Aliphatic polyurethane enamel applied at spreading rate recommended to achieve a dry film thickness of 1.5 to 4 mils (0.038 to 0.102 mm).
    - d. Topcoat: Aliphatic polyurethane enamel applied at spreading rate recommended to achieve a dry film thickness of 1.5 to 4 mils (0.038 to 0.102 mm).
- E. Wood Substrates: Exterior wood siding and trim, woodwork, doors and windows.
1. Latex System:
    - a. Prime Coat: 100 percent acrylic water-based primer.
      - 1) Basis-of-Design Product: All Purpose Stain Blocking Primer 470011 by Miller.
    - b. Intermediate Coat: Polyurethane, two-component, pigmented, gloss, matching topcoat.
      - 1) Basis-of-Design Product: Same as topcoat.
    - c. Topcoat: 100 percent acrylic water-based paint.
      - 1) Basis-of-Design Product: Acri-Lite Exterior by Miller.
      - 2) Gloss: Match existing.
- F. Existing Unit Ventilators, P-11:
1. Powder-Coat Finish: Provide shop-applied powder-coat finish meeting AAMA 2603, except with a minimum dry film thickness of 1.5 mils. After cleaning and pretreating, apply manufacturer's standard multi-coat powder coat finish to a dry film thickness in compliance with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish. Shop applied.
    - a. Color: As selected by Architect from manufacturer's standard range of colors.
  2. Applications: Provide high performance coating at Coaledo Hall existing unit ventilators; or as indicated.

## 2.5 INTERIOR HIGH-PERFORMANCE COATING SYSTEMS

- A. Concrete: At existing and new horizontal concrete floors scheduled to be sealed.
1. Horizontal Concrete Surface Sealer: Silane/siloxane-blend, penetrating floor sealer, clear, proprietary blend with minimum 40 percent silane content; stain resistance with graffiti control; for areas subject to snow and freeze conditions.
    - a. Basis-of-Design Products: Protectosil Aqua-Trete SG by Protectosil, div. of Evonik.
    - b. Other Approved Manufacturers:
      - 1) BASF; [www.master-builder-solutions.basf.com](http://www.master-builder-solutions.basf.com).
      - 2) Euclid Chemical Company; [www.euclidchemical.com](http://www.euclidchemical.com).
      - 3) Fabrikem; [www.fabrikem.com](http://www.fabrikem.com).
      - 4) L&M Construction Chemicals; div. of Laticrete International, Inc.; [www.laticrete.com](http://www.laticrete.com).
- B. Ferrous Metal: Provide the following finish system over interior ferrous-metal surfaces:



1. Semigloss Finish: One finish coat over an intermediate coat and a primer.
    - a. Primer: Epoxy primer applied at spreading rate recommended.
    - b. Intermediate Coat: Epoxy applied at spreading rate recommended to achieve a dry film thickness of 2 to 4 mils (0.051 to 0.102 mm).
    - c. Topcoat: Semigloss epoxy applied at spreading rate recommended to achieve a dry film thickness of 2 to 5 mils (0.051 to 0.127 mm).
    - d. Application: All interior ferrous metal substrates EXCEPT underside of metal floor and roof decks and piping, ductwork, conduit and other materials requiring painting suspended at the underside of floor and roof decks.
  2. Matte Finish: One finish coat over an intermediate coat and a primer.
    - a. Primer: Epoxy primer applied at spreading rate recommended.
    - b. Intermediate Coat: Epoxy applied at spreading rate recommended to achieve a dry film thickness of 2 to 4 mils (0.051 to 0.102 mm).
    - c. Topcoat: Matte epoxy applied at spreading rate recommended to achieve a dry film thickness of 2 to 5 mils (0.051 to 0.127 mm).
    - d. Application: Underside of metal floor and roof decks and piping, ductwork, conduit and other materials requiring painting suspended at the underside of floor and roof decks.
- C. Nonferrous Metal: Provide the following finish system over interior nonferrous-metal surfaces:
1. Semigloss Finish: One finish coat over an intermediate coat and a primer.
    - a. Primer: Acrylic or epoxy primer, as recommended for this substrate, applied at spreading rate recommended.
    - b. Intermediate Coat: Epoxy applied at spreading rate recommended to achieve a dry film thickness of 2 to 5 mils (0.051 to 0.127 mm).
    - c. Topcoat: Semigloss epoxy applied at spreading rate recommended to achieve a dry film thickness of 2 to 5 mils (0.051 to 0.127 mm), unless otherwise indicated.

## 2.6 COLOR SCHEDULE

- A. Coordinate finish colors with systems indicated in other Sections.
- B. Basis-of-design manufacturer is for color only. Provide color match where different paint manufacturer is used.
- C. Where surfaces are scheduled for primer only, provide primer indicated for substrate in systems listed above.
- D. Refer to systems for sheen. Confirmed during sample submittals.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. With Applicator present, examine substrates and conditions under which high-performance coatings will be applied, for compliance with coating application requirements.
  1. Apply coatings only after unsatisfactory conditions have been corrected and surfaces to receive coatings are thoroughly dry.
  2. Start of application is construed as Applicator's acceptance of surfaces within that particular area.

- B. Coordination of Work: Review other Sections in which primers or other coatings are provided to ensure compatibility of total systems for various substrates. On request, furnish information on characteristics of specified finish materials to ensure compatible primers.
  - 1. If a potential incompatibility of primers applied by others exists, obtain the following from the primer Applicator before proceeding:
    - a. Confirmation of primer's suitability for expected service conditions.
    - b. Confirmation of primer's ability to be top coated with materials specified.
  - 2. Notify the General Contractor about anticipated problems before using the coatings specified over substrates primed by others.

### 3.2 PREPARATION

- A. General: Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
  - 1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
- B. Cleaning: Before applying high-performance coatings, clean substrates of substances that could impair bond of coatings. Remove oil and grease before cleaning.
  - 1. Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be coated according to manufacturer's written instructions for each substrate condition and as specified.
  - 1. Provide barrier coats over incompatible primers or remove primers and reprime substrate.
  - 2. Cementitious Substrates: Prepare concrete, brick, and concrete masonry block, surfaces to be coated. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods to prepare surfaces.
    - a. Use abrasive blast-cleaning methods if recommended by coating manufacturer.
    - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not coat surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
- D. Material Preparation: Carefully mix and prepare coating materials according to manufacturer's written instructions.
  - 1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
  - 2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.
  - 3. Use only the type of thinners approved by manufacturer and only within recommended limits.
- E. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

### 3.3 APPLICATION

- A. General: Apply high-performance coatings according to manufacturer's written instructions.
  - 1. Use applicators and techniques best suited for the material being applied.
  - 2. Do not apply high-performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
  - 3. Coating colors, surface treatments, and finishes are indicated in the coating system descriptions.
  - 4. Provide finish coats compatible with primers used.
  - 5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, grilles, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
    - a. Coat surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
    - b. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Scheduling Coating: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration.
  - 1. The number of coats and film thickness required is the same regardless of application method.
    - a. Omit primer on metal surfaces that have been shop primed and touchup painted.
    - b. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
    - c. Where manufacturer's written instructions require sanding, sand between applications to produce a smooth, even surface.
    - d. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until coating has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat does not cause undercoat to lift or lose adhesion.
  - 2. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance. Give special attention to edges, corners, crevices, welds, exposed fasteners, and similar surfaces to ensure that they receive a dry film thickness equivalent to that of flat surfaces.
  - 3. Sequence: Roofing system substrate boards for fastened attachment shall be fully installed prior to painting of underside of metal roof decks, to ensure fasteners are painted-out with the deck and do not remain easily apparent.
- C. Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
  - 1. Brush Application: Use brushes best suited for material applied and of appropriate size for the surface or item being coated.
    - a. Apply primers and first coats by brush unless manufacturer's written instructions permit using roller or mechanical applicators.
    - b. Brush out and work brush coats into surfaces in an even film.

- c. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw glass lines and color breaks.
- 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for the material and texture required.
- 3. Spray Equipment: Use mechanical methods to apply coating if permitted by manufacturer's written instructions and governing regulations.
  - a. Use spray equipment with orifice size recommended by manufacturer for material and texture required.
  - b. Apply each coat to provide the equivalent hiding of brush-applied coats.
  - c. Do not double back with spray equipment building-up film thickness of two coats in one pass, unless recommended by manufacturer.
- D. Minimum Coating Thickness: Apply each material no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- F. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by manufacturer, to material required to be coated or finished that has not been prime coated by others.
  - 1. Recoat primed and sealed substrates if there is evidence of suction spots or unsealed areas in first coat, to ensure a finish coat with no burn-through or other defects caused by insufficient sealing.
- G. Completed Work: Match approved Samples for color, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

### 3.4 CLEANING

- A. Cleanup: At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
  - 1. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

### 3.5 PROTECTION

- A. Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
  - 1. Provide "Wet Paint" signs to protect newly coated finishes. After completing coating operations, remove temporary protective wrappings provided by others to protect their work.
  - 2. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces. Comply with procedures specified in PDCA P1.

END OF SECTION

## SECTION 10 44 15 - FIRE PROTECTION CABINETS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Fire-protection cabinets (FEC-1) for the following:
    - a. Portable fire extinguishers.
    - b. Fire-hose valves.
  - 2. Refurbishing of existing hose reel fire-protection cabinets.
  - 3. Automated external defibrillator (AED) cabinets.

#### 1.3 PREINSTALLATION CONFERENCE

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to fire-protection cabinets including, but not limited to, the following:
    - a. Schedules and coordination requirements.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed, semi-recessed, or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required, prepared on Samples 6 by 6 inches square.
- D. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semi-recessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.
- E. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

#### 1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers required by code are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

#### 1.6 SEQUENCING

- A. Apply decals and lettering on field-painted fire-protection cabinets after painting is complete.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.
- B. Electrical Components, Devices, and Accessories: For wired alarms at fire-protection cabinets, listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. NFPA Compliance, Extinguishers: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- D. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
- E. Provide fire extinguishers approved, listed, and labeled by FM Global; where required.
- F. The Basis-of-Design Product's performance criteria, product properties and attributes, including materials and methods used in fabrication of and/or the manufacturing process of individual components or for entire system, as indicated in manufacturers' current published product literature at the date of the Contract Documents, shall establish the minimum performance requirement for the Project, regardless of inclusion in This Section.

### 2.2 FIRE-PROTECTION CABINET FOR FIRE EXTINGUISHERS, FEC-1

- A. Cabinet Type: Suitable for fire extinguisher.
  - 1. Basis-of-Design Product: Ambassador Series - Steel Fire Extinguisher Cabinets by JL Industries, div. of Activar Construction Products Group, Inc.; [www.activarcpg.com/jl-industries](http://www.activarcpg.com/jl-industries).
- B. Application: Provide as indicated on Drawings.
- C. Cabinet Construction: Nonrated, except where indicated otherwise.
  - 1. Fire-Rated Cabinets: Provide fire-rated cabinets where located in fire-rated walls, matching wall rating designation. Rated cabinets shall match basis-of-design product indicated. Provide factory-drilled mounting holes.
- D. Cabinet Material:
  - 1. Semi-Recessed Tubs: Cold-rolled steel sheet; powder coat finish; manufacturer's standard white color.
- E. Door and Trim Construction: No. 4 stainless steel trim and flush cabinet door.
  - 1. Semi-Recessed Cabinet, FEC-1: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face.
    - a. Square-Edge Semi-recessed Trim: 1-1/2 inch flat trim.
  - 2. Door Style: Fully glazed panel with frame.
  - 3. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
    - a. Provide manufacturer's standard zinc-plated handle and roller latch.
    - b. Provide manufacturer's standard continuous hinge.

F. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Door Lock: Manufacturer's standard, where required.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated or as directed by Architect.
  - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
    - 1) Location: Applied to cabinet door.
    - 2) Application Process: Die-Cut.
    - 3) Lettering Color: Black.
    - 4) Orientation: Vertical.

G. Materials:

1. Cold-Rolled Steel: ASTM A1008, Commercial Steel (CS), Type B.
  - a. Finish: Baked enamel or powder coat.

2.3 FIRE-PROTECTION CABINET FOR FIRE-HOSE VALVES, VC-1 AND VC-2

A. Cabinet Type: Suitable for fire-hose valve.

1. Basis-of-Design Products:
  - a. VC-1: Model no. FRC8020, Fire Rated Recessed Alta Valve Cabinet by Potter Roemer Fire Pro; [www.potterroemer.com](http://www.potterroemer.com).
  - b. VC-2: Model no. 8020, Recessed Alta Valve Cabinet by Potter Roemer Fire Pro.

B. Cabinet Construction:

1. VC-1: Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- thick cold-rolled steel sheet lined with minimum 5/8-inch- thick fire-barrier material. Provide factory-drilled mounting holes.
2. VC-2: Nonrated.

C. Cabinet Material: Cold-rolled steel sheet.

1. Shelf: Same metal and finish as cabinet.

D. Recessed Cabinet:

1. Trimless with Concealed Flange: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet. Provide recessed flange, of same material as box, attached to box, to act as drywall bead.
2. Trimless with Hidden Flange: Flange of same metal and finish as box overlaps surrounding wall finish and is concealed from view by an overlapping door.
3. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

E. Cabinet Trim Material: Steel sheet.

F. Door Material: Steel sheet.

G. Door Style: Fully glazed panel with frame.

- H. Door Glazing: Tempered float glass (clear).
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
  - 1. Provide manufacturer's standard.
  - 2. Provide continuous hinge, of same material and finish as trim,, permitting door to open 180 degrees.
- J. Accessories:
  - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
  - 2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
  - 3. Break-Glass Door Handle: Manufacturer's standard, integral to glass with the words "PULL TO BREAK GLASS" applied to handle.
  - 4. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
  - 5. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
  - 6. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
    - a. Identify fire hose valve in fire-protection cabinet with the words "FIRE DEPARTMENT VALVE."
      - 1) Location: Applied to cabinet glazing.
      - 2) Application Process: Manufacturer's standard.
      - 3) Lettering Color: Black.
      - 4) Orientation: As indicated on Drawings.
- K. Materials:
  - 1. Cold-Rolled Steel: ASTM A1008, Commercial Steel (CS), Type B.
    - a. Finish: Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
    - b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    - c. Color: White, to match Architect's sample.
  - 2. Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

## 2.4 HOSE REEL FIRE-PROTECTION CABINETS

- A. Refurbishing of existing Hose Reel Fire-Protection Cabinets: Refer to Examination articles in Part 3.

## 2.5 DEFIBRILLATOR CABINETS

- A. Basis-of-Design Product: Model No. 1425 by JL Industries, div. of Activar Construction Products Group, Inc.; [www.activarcpg.com](http://www.activarcpg.com).



- B. Materials:
  - 1. Cabinet: 20-gauge, stainless steel cabinet; clear acrylic door.
  - 2. Handle: Solid die cast, chrome-plated.
  - 3. Closure: Adjustable roller catch.
  - 4. Hinge: Heavy-duty.
  - 5. Decals: As required by Code or authorities having jurisdiction (AHJ) for AED cabinets.
- C. Finish: Matching fire extinguisher cabinets.
- D. Alarm: Manufacturer's alarm. Key-activated audible door alarm, adjustable from 85 to 120 dB. Siren to be located inside cabinet. Alarm to be wired into terminal fire alarm system for remote monitoring. Provide connection to building power with battery backup.
- E. Door Locks: BHMA A156.11, E07121. Comply with Section 08 71 00 "Door Hardware."
  - 1. Lock cylinders and keying where noted:

## 2.6 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
  - 1. Weld joints and grind smooth.
  - 2. Provide factory-drilled mounting holes.
  - 3. Prepare doors and frames to receive locks.
  - 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
  - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
  - 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

## 2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in for cabinets to verify actual locations of piping connections before cabinet installation.

- B. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Existing Hose Reel Cabinets:
  - 1. Examine location of existing cabinets to verify compliance with mounting height acceptable to authorities having jurisdiction.
  - 2. Confirm need to relocate cabinet at a new location, or to refit within current location to become secure and plumb within existing opening and align with proposed wall finish.

### 3.2 PREPARATION

- A. Prepare recesses for recessed and semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

### 3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction, but no higher than the following.
  - 1. Fire-Protection Cabinets Installation height: Install at height conforming to NFPA 10.
    - a. 54 inches above finished floor to top of cabinet.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
  - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
  - 2. Provide inside latch and lock for break-glass panels.
  - 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

### 3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

## SECTION 10 11 00 - VISUAL DISPLAY UNITS

### 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. Markerboards (MB-1, MB-2, and MB-3.
- B. Related Requirements:
  - 1. Section 06 10 00 "Rough Carpentry" for coordination of wood blocking in walls to secure visual display units.
  - 2. Section 06 20 23 "Interior Finish Carpentry" for coordination of solid wood trim and veneer paneling.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
  - 2. Include electrical characteristics for motorized units.
- B. Shop Drawings: For visual display units.
  - 1. Include plans, elevations, sections, details, and attachment to other work.
  - 2. Show locations of panel joints.
  - 3. Include sections of typical trim members.
- C. Samples: For marker board and cork tack panels provide manufacturer's standard samples.
- D. Product Schedule: For visual display units. Use same designations indicated on Drawings.
- E. Qualification Data: For qualified Installer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of tackboards.
- G. Sample Warranties: For special warranties.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
  - 1. Build mockup of typical wall area at location directed by Architect. Include accessories.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

#### 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication.
  1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

#### 1.7 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Surfaces lose original writing and erasing qualities.
    - b. Surfaces exhibit crazing, cracking, or flaking.
  2. Warranty Period: 10 years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  1. Flame-Spread Index: 25 or less.
  2. Smoke-Developed Index: 50 or less.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

#### 2.2 MATERIALS

- A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.
- B. High-Pressure Plastic Laminate: NEMA LD 3.
- C. Polyester Fabric: Nondirectional weave, 100 percent polyester; weighing not less than 15 oz./sq. yd.; with surface-burning characteristics indicated.
- D. Hardboard: ANSI A135.4, tempered.
- E. Particleboard: ANSI A208.1, Grade M-1.
- F. Medium-Density Fiberboard: ANSI A208.2, Grade 130.

- G. Fiberboard: ASTM C 208 cellulosic fiber insulating board.
- H. Extruded Aluminum: ASTM B 221, Alloy 6063.
- I. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.
- J. Primer/ Sealer: Mildew-resistant primer/sealer complying with requirements in Section 09 91 00 "Painting" and recommended in writing by visual display unit manufacturer for intended substrate.

## 2.3 MANUFACTURERS

- A. Approved Manufacturers:
  - 1. Claridge; [www.claridgeproducts.com](http://www.claridgeproducts.com).
  - 2. Forbo Flooring Systems; [www.forbo.com](http://www.forbo.com).
  - 3. Platinum Visual Systems; [www.pvsusa.com](http://www.pvsusa.com)

## 2.4 MARKERBOARDS, MB-1, MB-2, AND MB-3

- A. Basis-of-Design Product, MB-1: Writanium Markerboards Framed Unit with Pen Tray by Platinum Visual Systems.
- B. Other Approved Product: Series 1 Boards by Claridge.
  - 1. Size: 4 feet by 8 feet.
  - 2. Color: Manufacturer's standard "White".
  - 3. Finish: As selected by Architect.
  - 4. Thickness: As selected by Architect.
  - 5. Accessories: Provide pen tray with each
  - 6. Application: Provide at Sumner and Coaledo Hall as indicated on Drawings.
- C. Basis-of-Design Product, MB-2: Platinum Visual Systems Floor to Ceiling Markerboard System (FCS), by Platinum Visual Systems.
- D. Other Approved: Floor to Ceiling Markerboard System (FCS) by Claridge.
  - 1. Size: As indicated on Drawings.
  - 2. Color: Manufacturer's standard "White".
  - 3. Finish: As selected by Architect.
  - 4. Thickness: As selected by Architect.
  - 5. Application: Provide at Sumner and Coaledo Lounge areas; or as indicated on Drawings.
- E. Basis-of-Design Product, MB-3: Marker and Tack Wall by Claridge.
- F. Or approved equal.
  - 1. Size: As indicated on Drawings with metal trim.
  - 2. Color: Manufacturer's standard "White".
  - 3. Cork Finish: As selected by Architect.
  - 4. Thickness: As selected by Architect.
  - 5. Application: Provide at Sumner South Hall; as indicated on Drawings.

## 2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603, except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of motorized, sliding visual display units.
- C. Examine walls and partitions for proper preparation and backing for visual display units.
- D. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.
- D. Prime wall surfaces indicated to receive visual display units and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.
- E. Prepare recesses for sliding visual display units as required by type and size of unit.

### 3.3 INSTALLATION

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

- B. Field-Assembled Visual Display Board Assemblies: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.
  - 1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.
  - 2. Where size of visual display board assemblies or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.
- C. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches o.c. Secure tops and bottoms of boards to walls.
- D. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings.

### 3.4 CLEANING AND PROTECTION

- A. Clean visual display units according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display units after installation and cleaning.

END OF SECTION

## SECTION 10 12 00 - DISPLAY CASES

### 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. Display cases.
- B. Related Requirements:
  - 1. Section 06 41 10 "Architectural Casework" for coordination of interior selection of solid surface and plastic laminate material.
  - 2. Section 09 22 16 "Non-Structural Metal Framing" for coordination of backing, blocking and framing members.

#### 1.3 DEFINITIONS

- A. Display Case: Glazed cabinet with solid surface and adjustable shelves.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for display cases. Include furnished specialties and accessories.
- B. Shop Drawings: For display cases.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Include sections of typical trim members.
- C. Samples for Verification: For each type of exposed finish for the following.
  - 1. Trim: 6-inch-long sections of each trim profile including corner section.
- D. Product Test Reports: For tackboard panels, for tests performed by a qualified testing agency.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For display cases to include in maintenance manuals.

#### 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install display cases for indoor installations until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of openings for display cases by field measurements before fabrication.

#### 1.7 QUALITY ASSURANCE

- A. Forest Certification: Provide wood products made from forests certified by an FSC-accredited



certification body.

1. All Non-FSC Wood in Assemblies with FSC-Certified Wood: Meet FSC Controlled Wood (CW) criteria.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain display cases from single source from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  1. Flame-Spread Index: 25 or less.
  2. Smoke-Developed Index: 450 or less.
- B. Recycled Content:
  1. Particleboard and MDF: Provide particleboard and MDF with minimum 80 percent recycled content. Provide plastic panels with recycled content.
- C. Composite Wood Installed Within the Building Interior: Comply with California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM), Phase II for ultra-low-emitting formaldehyde (ULEF) resins or containing no formaldehyde resins.

### 2.3 DISPLAY CASE

- A. Recessed Display Case: Factory-fabricated unit of wall-mounted cabinet with solid surface at inside surface and operable glazed doors.
  1. Display Case Cabinet: Custom wood.
  2. Species: As selected by Architect.
  3. Face Frame: Wood trim.
  4. Wood Finish: Clear.
- B. Glazed Sliding Doors: Tempered glass; unframed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.
  1. Thickness: Not less than 1/4-inch thick.
  2. Number of Doors: As indicated on Drawings.
- C. Back Panel: Tackboard panel. Side Panels: White melamine finish.
- D. Size: As indicated on Drawings.

### 2.4 MATERIALS

- A. Particleboard: ANSI A208.1, Grade M-1.
- B. Clear Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.
- C. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.
  1. Color: White.

- D. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless-steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.

## 2.5 FABRICATION

- A. Fabricate display cases to requirements indicated for dimensions, design, and thickness and finish of materials.
- B. Use metals and shapes of thickness and reinforcing required to produce flat surfaces, and to impart strength for size, design, and application indicated.
- C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.
- D. Fabricate shelf standards plumb and at heights to align shelf brackets for level shelves.

## 2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of illuminated units.
- C. Examine walls and partitions for proper backing for display cases.
- D. Examine walls and partitions for suitable framing depth if recessed units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare recesses for display cases as required by type and size of unit.

### 3.3 INSTALLATION

- A. General: Install units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
- B. Recessed Display Cases: Attach units to wall framing with fasteners at not more than 16 inches o.c. Attach aluminum trim over edges of recessed display cases and conceal grounds and clips. Attach trim with fasteners at not more than 24 inches o.c.
- C. Install display case shelving level and straight.

3.4 ADJUSTING AND CLEANING

- A. Adjust doors to operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.
- B. Touch up factory-applied finishes to restore damaged areas.

END OF SECTION

## SECTION 10 14 23 – PANEL SIGNAGE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Code-required room identification signs (SIGN-1).
  - 2. Code-required egress signs, except lighted egress signage.
  - 3. Modular signage.
- B. Related Requirements:
  - 1. Division 26 "Electrical" for lighted egress signage.

#### 1.3 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."
  - 1. 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.

#### 1.4 SUBMITTALS

- A. General: Ensure that requests for substitution have been provided to the Architect and that the Architect has provided clear approval of the proposed substitution products prior to order placement, delivery and installation of products. Refer to Section 01 25 00 "Product Substitution Procedures".
- B. Product Data: For information only, include manufacturer's printed specifications, anchorage details and installation, and maintenance instructions for products to be used in the fabrication of signage and graphics work, and installation instructions for each type of sign and graphic unit.
- C. Shop Drawings: For manufacturing including plans, elevations, sections, details, fabrication and erection of signs and graphic work at not less than 1:20 scale. Show jointage, anchorage, accessory items, and finishes. Submit full-scale drawings of typical sign faces showing copy layout. Half-scale drawings shall be sufficient for sign faces 1 m by 1 m and larger.
- D. Samples for Initial Selection: For each type of sign indicated.
  - 1. Acrylic and Polycarbonate Sheet: Samples of each paint and silkscreen ink color painted onto the required thickness of material.
- E. For identification purposes, mark samples with the appropriate sign type application.
- F. Manufacturer Certificates: Signed by manufacturers certifying that they comply with requirements.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications.

1.7 WARRANTY

- A. Special Warranty: Manufacturer Warranty Period of Five years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
- B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.2 SIGNS

- A. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles.
- B. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles.
- C. Interior Informational Signs: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles.
- D. Emergency Evacuation Maps: Provide code required signage to meet occupancy.

2.3 SIGNAGE MATERIALS

- A. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- B. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.
- C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 MODULAR SIGNS

- A. Modular Signs: Sign system with removable inserts for graphics and copy attached to a receiver frame system using clips, splines, or comparable method. Provide system with modular increments of height and width, permitting assembly of units with multiple inserts of varying size.
  - 1. Sign Size: As indicated.
  - 2. Provide tamper-resistant feature requiring special tool to change inserts.
  - 3. Backer Panel: Shaped, decorative backing panel mounted behind modular signage system as selected from manufacturer's full range.
  - 4. Double-Faced Signs: Provide signs with two faces back-to-back for signs suspended from ceiling or mounted perpendicular to wall, and as indicated.
- B. Inserts:

1. Module Height: System of inserts fabricated in multiples of manufacturer's standard dimension.
  2. Type: Rigid plastic for applied graphics.
    - a. Secondary Inserts: ADA-compliant with raised text and Braille.
  3. Finish: As selected by Architect from manufacturer's full range.
  4. Color and Pattern: As selected by Architect from manufacturer's full range.
- C. Graphics and Copy:
1. Surface Applied: Direct print.
  2. Raised, ADA Compliant: Manufacturer's standard raised characters and Braille.
  3. Etched and Filled: Sign face etched or routed to receive enamel-paint infill.
  4. Engraved: Characters engraved through plastic-laminate face sheet to expose contrasting phenolic core.
  5. Text and Typeface: Typeface as selected by Architect from manufacturer's full range. Finish raised characters to contrast with background color, and finish Braille to match background color.
- D. End Caps and Trim:
1. Side Trim: Continuous extruded-aluminum trim attached to message-strip receiver frame.
  2. End Caps: Individual snap-on caps for each message strip.
  3. Profile: Square.
  4. Top and Bottom Trim: Message strips with integral trim profile to provide finished appearance. Provide square profile.
- E. Mounting: Mount modular signs to wall surfaces using manufacturer's standard method.
1. Suspended Mounting: Provide hanger and bracket designed to support signs from suspended ceiling grid. Factory finish to match Architect's sample color unless otherwise indicated.
  2. Perpendicular Wall Mount: Provide bracket designed to support signs perpendicular to wall surface, and to suit mounting conditions. Attach with screws or other method capable of supporting weight of sign. Factory finish to match Architect's sample color unless otherwise indicated.
- F. Accessories: Provide sliding insert to indicate room occupancy where indicated.
- 2.5 ACCESSORIES
- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined.
  - B. Adhesive: As recommended by sign manufacturer.
  - C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, with adhesive on both sides.
  - D. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.
  - E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.
- 2.6 FABRICATION
- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

- B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into panel surface indicated to produce precisely formed copy, incised to uniform depth.
- C. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.
- D. Shop- and Subsurface-Applied Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fishmouths.
- E. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
- F. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
- B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls as indicated and according to accessibility standard.

END OF SECTION

## SECTION 10 21 13 - TOILET COMPARTMENTS

### 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. Toilet compartments configured as toilet partitions (TC-1).
- B. Related Requirements:
  - 1. Section 06 10 00 "Rough Carpentry" for blocking.
  - 2. Section 09 30 00 "Tiling" for coordination with anchors in tile assemblies.
  - 3. Section 10 28 00 "Restroom and Custodial Accessories" for toilet tissue dispensers, grab bars, and similar accessories mounted on toilet compartments.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
- B. Shop Drawings: For toilet compartments.
  - 1. Include plans, elevations, sections, details, and attachment details.
  - 2. Show locations of cutouts for compartment-mounted toilet accessories.
  - 3. Show locations of reinforcements for compartment-mounted grab bars and locations of blocking for surface-mounted toilet accessories.
  - 4. Show locations of centerlines of toilet fixtures.
  - 5. Show locations of floor drains.
  - 6. Show ceiling-mounted items and overhead support or bracing locations.
- C. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
  - 1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
  - 2. Each type of hardware and accessory.
- D. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.
- E. Product Certificates: For each type of toilet compartment.
- F. Maintenance Data: For toilet compartments to include in maintenance manuals.

#### 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Where requested by Owner, provide the following:



1. Door Hinges: One hinge(s) with associated fasteners.
2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
3. Door Bumper: One door bumper(s) with associated fasteners.
4. Door Pull: One door pull(s) with associated fasteners.
5. Fasteners: Ten fasteners of each size and type.

#### 1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

#### 2.2 MANUFACTURER

1. Basis-of-Design Manufacturer: Scranton Products; [www.scrantonproducts.com](http://www.scrantonproducts.com)
- B. Other Approved:
  1. Accurate Partitions; [accuratepartitions.com](http://accuratepartitions.com).
  2. Ampco by AJW Architectural Products; [www.ajw.com](http://www.ajw.com).
  3. Hadrian; [www.hadrian-inc.com](http://www.hadrian-inc.com).
  4. Legacy Polymers; [www.legacypolymers.com](http://www.legacypolymers.com).
  5. Or approved substitution by Architect.

#### 2.3 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Basis-of-Design Product, TC-1: HDPE by Scranton Products.
  1. Color: "Grey".
  2. Finish: Orange peel.
  3. Thickness: As selected by Architect.
  4. Application: Provide at Sumner Hall and Coaledo Hall to match Umpqua Hall.
- B. Toilet-Enclosure Style: Floor anchored, overhead-braced and zero sight-line.
- C. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, no-sightline system, and with homogenous color and pattern throughout thickness of material.
  1. Minimum 25 percent to 100 percent post-consumer content toilet partitions where possible.
- D. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.
- E. Brackets (Fittings) at Toilet Partitions:
  1. Concealed type from partition exterior; stainless steel.

## 2.4 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's operating hardware and accessories.
  - 1. Material: Stainless steel.
  - 2. Hinges: Manufacturer's standard continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door.
  - 3. Latch and Keeper: Manufacturer's standard recessed latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
  - 4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
  - 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
  - 6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel anchors compatible with related materials.

## 2.5 MATERIALS

- A. Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface Aluminum Castings: ASTM B26.
- B. Aluminum Extrusions: ASTM B221.
- C. Stainless-Steel Sheet: ASTM A666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless-Steel Castings: ASTM A743.

## 2.6 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories and solid blocking within panel where required for attachment of toilet accessories.
- B. Floor Mounted, Overhead Braced Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for connection to floor.
- C. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch-wide clear opening for compartments designated as accessible.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
  - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
  - 1. Maximum Clearances:
    - a. Pilasters and Panels: 1/2 inch.
    - b. Panels and Walls: 1 inch.
  - 2. Stirrup Brackets: Secure panels to walls with continuous brackets attached full height of panels.
    - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
    - b. Align brackets at pilasters with brackets at walls.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION

## SECTION 10 26 00 - WALL PROTECTION

### 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. Corner guards (CG-1, CG-2, and GC-3).
  - 2. Wall protection (WP-1).
- B. Related Requirements:
  - 1. Section 08 71 00 "Door Hardware" for metal protective trim units, according to BHMA A156.6, used for armor, kick, mop, and push plates.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
  - 2. Include fire ratings of units recessed in fire-rated walls and listings for door-protection items attached to fire-rated doors.
- B. Shop Drawings: For each type of wall protection showing locations and extent.
  - 1. Include plans, elevations, sections, and attachment details.
- C. Material Certificates: For each type of exposed plastic material.
- D. Sample Warranty: For special warranty.
- E. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.
  - 1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.
- F. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
  - 1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
  - 2. Keep plastic materials out of direct sunlight.

3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
  - a. Store corner-guard covers in a vertical position.

#### 1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
    - b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
  2. Warranty Period: Five years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  1. Flame-Spread Index: 25 or less.
  2. Smoke-Developed Index: 450 or less.

#### 2.2 CORNER GUARDS, CG-1

- A. Surface-Mounted, Metal Corner Guards, CG1: Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
- B. Basis-of-Design Product: Custom made.
  1. Surface-Mounted Corner Guards, CG-1:
    - a. Configuration: L-shaped, as indicated.
    - b. Material: 16-gauge metal.
    - c. Legs: 2 in.
    - d. Height: As indicated in Drawings.
    - e. Corner Radius: 1/4 inch maximum.
    - f. Mounting: Adhesive or double stick foam tape.
    - g. Finish and Color: Powder coat, "white".
    - h. Application: Provide at Coaledo and Sumner Hall; as indicated on Drawings.
  2. Surface-Mounted Corner Guards, CG-2:
    - a. Configuration: U-shaped, as indicated.
    - b. Material: 16-gauge metal.
    - c. Legs: 2 in.
    - d. Height: As indicated in Drawings.
    - e. Corner Radius: 1/4 inch maximum.
    - f. Mounting: Adhesive or double stick foam tape.

- g. Finish and Color: Powder coat, "white".
  - h. Application: Provide at Coaledo and Sumner Hall; as indicated on Drawings.
- 3. Surface-Mounted Corner Guards, CG-3:
  - a. Configuration: L-shaped, as indicated.
  - b. Material: 16-gauge metal.
  - c. Legs: 2 in.
  - d. Height: As indicated in Drawings.
  - e. Corner Radius: 1/4 inch maximum.
  - f. Mounting: Adhesive or double stick foam tape.
  - g. Finish: Stainless steel.
  - h. Application: Provide at Exterior Walls in Coaledo Hall; as indicated on Drawings.

## 2.3 WALL PROTECTION

- A. Basis-of-Design Product, WP-1: Acrovyn 4000 Wall Covering by Construction Specialties, Inc.; [www.c-sgroup.com](http://www.c-sgroup.com).
  - 1. Material: Engineered PETG rigid sheet.
  - 2. Thickness: 0.040 inch.
  - 3. Size: As indicated on Drawings.
  - 4. Mounting: Manufacturer's standard.
  - 5. Color: As selected by Architect.
- B. Application: Provide at Sumner Hall as indicated on Drawings.

## 2.4 MATERIALS

- A. Adhesive: Interior Projects Construction Adhesive (Low-VOC) No. LN-704/LNP-704 by Liquid Nails, div. of PPG Industries, Inc.; [www.liquidnails.com](http://www.liquidnails.com).
- B. Basis-of-Design Product, Double-Sided Foam Tape: 1-inch VHB Double Sided Foam Adhesive Tape by 3M; [www.3M.com](http://www.3M.com).

## 2.5 FABRICATION

- A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.
- B. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

## 2.6 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of the Work.
- B. Examine walls to which wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
  - 1. For wall protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing wall and door protection.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

#### 3.3 INSTALLATION

- A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

#### 3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION

## SECTION 10 28 00 - RESTROOM AND CUSTODIAL ACCESSORIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes provision of all Contractor-Furnished, Contractor-Installed (CFCI) restroom and custodial accessories as indicated on the Drawings and as specified herein.

- 1. Contractor shall provide and install the following:

- a. Grab bars (GB-1, GB-2, GB-3, GB-4).
    - b. Mirror (MR-1, MR-2 and MR-3).
    - c. Mop holder (MH-1).
    - d. Paper Towel Dispenser (PTD-1 and PTD-2).
    - e. Seat Cover Dispenser (SCD-1).
    - f. Soap Dispenser (SD-1).
    - g. Shower Curtain Rod (SCR-1).
    - h. Shower Curtain (SC-1).
    - i. Sanitary Napkin Disposal (SND-1).
    - j. Toilet Tissue Dispenser (TTD-1, TTD-2, TTD-3, and TTD-4).
    - k. Recessed Waste Receptacle (RWR-1).

- B. Related Requirements:

- 1. Section 06 10 00 "Rough Carpentry" for coordination of blocking and bracing within walls

#### 1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
  - 1. Identify locations using room designations indicated.



- 2. Identify accessories using designations indicated.
  - C. Sample Warranty: For manufacturer's special warranty.
- 1.5 WARRANTY
- A. Manufacturer's Special Warranty for Mirrors: Manufacturer Warranty Period of 15 years.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.
  - 1. Basis-of-Design Manufacturers:
    - a. Bobrick Washroom Equipment, Inc.; [www.bobrick.com](http://www.bobrick.com).
    - b. Inpro Architectural Products; [www.inprocorp.com](http://www.inprocorp.com).

2.2 RESTROOM ACCESSORIES, CONTRACTOR-FURNISHED, CONTRACTOR-INSTALLED (CFCI)

- A. Grab Bars, GB-1 (CFCI): Stainless steel.
  - 1. Basis-of-Design Product: Model no. B-5806 Series by Bobrick.
    - a. Size: 18 inches.
  - 2. Application: Provide at Restrooms at Coaledo Hall; or as indicated in Drawings
- B. Grab Bars, GB-2 (CFCI): Stainless steel.
  - 1. Basis-of-Design Product: Model no. B-5806 Series by Bobrick.
    - a. Size: 36 inches.
  - 2. Application: Provide at Restrooms at Coaledo Hall; or as indicated in Drawings
- C. Grab Bars, GB-3 (CFCI): Stainless steel.
  - 1. Basis-of-Design Product: Model no. B-5806 Series by Bobrick.
    - a. Size: 42 in.
  - 2. Application: Provide at Restrooms at Coaledo Hall; or as indicated in Drawings
- D. Grab Bars, GB-4 (CFCI): Stainless steel.
  - 1. Basis-of-Design Product: Model no. B-5806 Series by Bobrick.
    - a. Size: 24 in.
  - 2. Application: Provide at Restrooms at Sumner Hall; or as indicated in Drawings
- E. Mirror, MR-1 (CFCI):
  - 1. Basis-of-Design Product: No. B-165 2436 Mirror with Stainless Steel Channel Frame by Bobrick.
    - a. Size: 24 in. by 36 in.
  - 2. Application: Provide at Restrooms at Coaledo Hall; or as indicated in Drawings
- F. Mirror, MR-2 (CFCI):
  - 1. Basis-of-Design Product: Silvered, tempered float glass with metal J-channel molding.
    - a. Size: As indicated.

2. Application: Provide at Restrooms at Coaledo Hall; or as indicated in Drawings
- G. Mirror, MR-3 (CFCI):
  1. Basis-of-Design Product: Model no. B-165 by Bobrick.
  2. Size: 24 by 60 inches.
  3. Application: Provide at Restrooms at Coaledo Hall; or as indicated in Drawings
- H. Mop Holder, MH-1 (CFCI).
  1. Basis-of-Design Product: Model no. B239x34 by Bobrick.
  2. Size: 34 in. by 13 in.
  3. Application: As indicated in Drawings.
- I. Paper Towel Dispenser (PTD-1).
  1. Basis-of-Design Product: Model no. B-72974 by Bobrick.
  2. Application: Provide at Paramedicine Laboratory Prep-Area; or as indicated in Drawings.
- J. Paper Towel Dispenser (PTD-2).
  1. Basis-of-Design Product: Model no. B-3949 Surface-Mounted Convertible Paper Towel Dispenser/ Waste Receptacle by Bobrick.
  2. Finish: Stainless steel, satin (SSS).
  3. Application: Provide at Coaledo Hall as indicated in Drawings.
- K. Seat Cover Dispenser (SCD-1).
  1. Basis-of-Design Product: Model no. B-221 by Bobrick.
  2. Mounting Type: Surface mounted.
  3. Size:
    - a. Width: 15-3/4 inches.
    - b. Height: 11 inches.
    - c. Depth: 2 inches.
  4. Finish: Stainless steel, type 304.
  5. Application: Provide at Restrooms at Coaledo Hall; or as indicated in Drawings
- L. Soap Dispenser (SD-1).
  1. Basis-of-Design Product: Model no. B-2111 by Bobrick.
  2. Mounting Type: Surface mounted.
  3. Size: 8-1/8 in. by 4-3/4 in.
  4. Finish: Stainless steel, type 304.
  5. Application: Provide at Restrooms at Coaledo Hall; or as indicated in Drawings
- M. Shower Curtain Rod (SCR-1).
  1. Basis-of-Design Product: Model no. B-6047x60 Extra Heavy Duty Shower Curtain Rod by Bobrick.
  2. Mounting Type: Surface mounted.
  3. Size: 60 inches.
  4. Diameter: 1-1/4 inch.

5. Gauge: 18-gauge.
  6. Finish: Stainless steel, type 304.
  7. Application: Provide at Restrooms at Coaledo Hall; or as indicated in Drawings
- N. Shower Curtain (SC-1).
1. Basis-of-Design Product: Commercial Shower Curtain by InPro.
  2. Width Size: 72 inches.
  3. Fabric: Chalet; 100 percent Polyester.
  4. Color: "Blue Moon".
  5. Application: Provide at Simulation Restrooms at Sumner Hall; or as indicated in Drawings
- O. Sanitary Napkin Disposal, SND-1
1. Basis-of-Design Product: Model no. B- B-270 Surface-Mounted Sanitary Napkin Disposal by Bobrick.
  2. Mounting Type: Surface mounted.
  3. Capacity: 1 gal.
  4. Size:
    - a. Width: 7-1/2 inches.
    - b. Height: 10 inches.
    - c. Depth: 3-13/16 inches.
  5. Finish: Stainless steel, type 304.
  6. Application: Provide at Restroom at Coaledo Hall; or as indicated in Drawings
- P. Toilet Tissue Dispenser (TTD-1).
1. Basis-of-Design Product: Model no. B-2888 Surface-Mounted Multi-Roll Dispenser by Bobrick.
  2. Mounting Type: Surface mounted.
  3. Size:
    - a. Width: 6-1/16 inches.
    - b. Height: 11 inches.
    - c. Depth: 5-15/16 inches.
  4. Finish: Stainless steel, type 304.
  5. Application: Provide at Restrooms at Coaledo Hall; or as indicated in Drawings
- Q. Toilet Tissue Dispenser (TTD-2).
1. Basis-of-Design Product: Model no. B-347 Partition-Mounted Seat-Cover Dispenser and Toilet Tissue Dispenser, 2-sided Dispenser by Bobrick.
  2. Mounting Type: Surface mounted.
  3. Size:
    - a. Width: 15-1/2 inches.
    - b. Height: 28-7/8 inches.
    - c. Finish: Stainless steel, type 304.

4. Finish: Stainless steel, type 304.
5. Application: Provide at Restrooms at Coaledo Hall; or as indicated in Drawings
- R. Toilet Tissue Dispenser (TTD-3).
  1. Basis-of-Design Product: Model no. B-357 Partition-Mounted Seat-Cover Dispenser, Sanitary Napkin Disposal and Toilet Tissue Dispenser, 2-sided by Bobrick.
  2. Mounting Type: Surface mounted.
  3. Size:
    - a. Width: 15-1/2 inches.
    - b. Height: 28-7/8 inches.
    - c. Finish: Stainless steel, type 304.
  4. Application: Provide at Restrooms at Coaledo Hall; or as indicated in Drawings
- S. Toilet Tissue Dispenser (TTD-4).
  1. Basis-of-Design Product: Model no. B-3579 Surface-Mounted Seat-Cover Dispenser, Sanitary Napkin Disposal and Toilet Tissue Dispenser by Bobrick.
  2. Mounting Type: Surface mounted.
  3. Size:
    - a. Width: 17-3/16 inches.
    - b. Height: 30-5/8 inches.
    - c. Depth: 3-5/16 inches.
  4. Finish: Stainless steel, type 304.
  5. Application: Provide at Restrooms at Coaledo Hall; or as indicated in Drawings
- T. Recessed Waste Receptacle (RWR-1).
  1. Basis-of-Design Product: Model no. B-3644 Recessed Waste Receptacle by Bobrick.
  2. Mounting Type: Recessed.
  3. Size:
    - a. Width: 17-3/16 inches.
    - b. Height: 30-5/8 inches.
    - c. Depth: 8-1/8 inches.
  4. Finish: Stainless steel, type 304.
  5. Application: Provide at Dental Lab at Coaledo Hall; or as indicated in Drawings

## 2.3 MATERIALS

- A. Stainless Steel: ASTM A666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B19, flat products; ASTM B16, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.
- C. Steel Sheet: ASTM A1008, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A653, with G60 hot-dip zinc coating.

- E. Galvanized-Steel Mounting Devices: ASTM A153, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

#### 2.4 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf when tested according to ASTM F446.

END OF SECTION

## SECTION 10 44 15 - FIRE PROTECTION CABINETS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Fire-protection cabinets (FEC-1) for the following:
    - a. Portable fire extinguishers.
    - b. Fire-hose valves.
  - 2. Refurbishing of existing hose reel fire-protection cabinets.
  - 3. Automated external defibrillator (AED) cabinets.

#### 1.3 PREINSTALLATION CONFERENCE

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to fire-protection cabinets including, but not limited to, the following:
    - a. Schedules and coordination requirements.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed, semi-recessed, or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required, prepared on Samples 6 by 6 inches square.
- D. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semi-recessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.
- E. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

#### 1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers required by code are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

#### 1.6 SEQUENCING

- A. Apply decals and lettering on field-painted fire-protection cabinets after painting is complete.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.
- B. Electrical Components, Devices, and Accessories: For wired alarms at fire-protection cabinets, listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. NFPA Compliance, Extinguishers: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- D. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
- E. Provide fire extinguishers approved, listed, and labeled by FM Global; where required.
- F. The Basis-of-Design Product's performance criteria, product properties and attributes, including materials and methods used in fabrication of and/or the manufacturing process of individual components or for entire system, as indicated in manufacturers' current published product literature at the date of the Contract Documents, shall establish the minimum performance requirement for the Project, regardless of inclusion in This Section.

### 2.2 FIRE-PROTECTION CABINET FOR FIRE EXTINGUISHERS, FEC-1

- A. Cabinet Type: Suitable for fire extinguisher.
  - 1. Basis-of-Design Product: Ambassador Series - Steel Fire Extinguisher Cabinets by JL Industries, div. of Activar Construction Products Group, Inc.; [www.activarcpg.com/jl-industries](http://www.activarcpg.com/jl-industries).
- B. Application: Provide as indicated on Drawings.
- C. Cabinet Construction: Nonrated, except where indicated otherwise.
  - 1. Fire-Rated Cabinets: Provide fire-rated cabinets where located in fire-rated walls, matching wall rating designation. Rated cabinets shall match basis-of-design product indicated. Provide factory-drilled mounting holes.
- D. Cabinet Material:
  - 1. Semi-Recessed Tubs: Cold-rolled steel sheet; powder coat finish; manufacturer's standard white color.
- E. Door and Trim Construction: No. 4 stainless steel trim and flush cabinet door.
  - 1. Semi-Recessed Cabinet, FEC-1: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face.
    - a. Square-Edge Semi-recessed Trim: 1-1/2 inch flat trim.
  - 2. Door Style: Fully glazed panel with frame.
  - 3. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
    - a. Provide manufacturer's standard zinc-plated handle and roller latch.
    - b. Provide manufacturer's standard continuous hinge.

F. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Door Lock: Manufacturer's standard, where required.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated or as directed by Architect.
  - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
    - 1) Location: Applied to cabinet door.
    - 2) Application Process: Die-Cut.
    - 3) Lettering Color: Black.
    - 4) Orientation: Vertical.

G. Materials:

1. Cold-Rolled Steel: ASTM A1008, Commercial Steel (CS), Type B.
  - a. Finish: Baked enamel or powder coat.

2.3 FIRE-PROTECTION CABINET FOR FIRE-HOSE VALVES, VC-1 AND VC-2

A. Cabinet Type: Suitable for fire-hose valve.

1. Basis-of-Design Products:
  - a. VC-1: Model no. FRC8020, Fire Rated Recessed Alta Valve Cabinet by Potter Roemer Fire Pro; [www.potterroemer.com](http://www.potterroemer.com).
  - b. VC-2: Model no. 8020, Recessed Alta Valve Cabinet by Potter Roemer Fire Pro.

B. Cabinet Construction:

1. VC-1: Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- thick cold-rolled steel sheet lined with minimum 5/8-inch- thick fire-barrier material. Provide factory-drilled mounting holes.
2. VC-2: Nonrated.

C. Cabinet Material: Cold-rolled steel sheet.

1. Shelf: Same metal and finish as cabinet.

D. Recessed Cabinet:

1. Trimless with Concealed Flange: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet. Provide recessed flange, of same material as box, attached to box, to act as drywall bead.
2. Trimless with Hidden Flange: Flange of same metal and finish as box overlaps surrounding wall finish and is concealed from view by an overlapping door.
3. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

E. Cabinet Trim Material: Steel sheet.

F. Door Material: Steel sheet.

G. Door Style: Fully glazed panel with frame.



- H. Door Glazing: Tempered float glass (clear).
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
  - 1. Provide manufacturer's standard.
  - 2. Provide continuous hinge, of same material and finish as trim,, permitting door to open 180 degrees.
- J. Accessories:
  - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
  - 2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
  - 3. Break-Glass Door Handle: Manufacturer's standard, integral to glass with the words "PULL TO BREAK GLASS" applied to handle.
  - 4. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
  - 5. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
  - 6. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
    - a. Identify fire hose valve in fire-protection cabinet with the words "FIRE DEPARTMENT VALVE."
      - 1) Location: Applied to cabinet glazing.
      - 2) Application Process: Manufacturer's standard.
      - 3) Lettering Color: Black.
      - 4) Orientation: As indicated on Drawings.
- K. Materials:
  - 1. Cold-Rolled Steel: ASTM A1008, Commercial Steel (CS), Type B.
    - a. Finish: Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
    - b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    - c. Color: White, to match Architect's sample.
  - 2. Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

## 2.4 HOSE REEL FIRE-PROTECTION CABINETS

- A. Refurbishing of existing Hose Reel Fire-Protection Cabinets: Refer to Examination articles in Part 3.

## 2.5 DEFIBRILLATOR CABINETS

- A. Basis-of-Design Product: Model No. 1425 by JL Industries, div. of Activar Construction Products Group, Inc.; [www.activarcpg.com](http://www.activarcpg.com).

- B. Materials:
  - 1. Cabinet: 20-gauge, stainless steel cabinet; clear acrylic door.
  - 2. Handle: Solid die cast, chrome-plated.
  - 3. Closure: Adjustable roller catch.
  - 4. Hinge: Heavy-duty.
  - 5. Decals: As required by Code or authorities having jurisdiction (AHJ) for AED cabinets.
- C. Finish: Matching fire extinguisher cabinets.
- D. Alarm: Manufacturer's alarm. Key-activated audible door alarm, adjustable from 85 to 120 dB. Siren to be located inside cabinet. Alarm to be wired into terminal fire alarm system for remote monitoring. Provide connection to building power with battery backup.
- E. Door Locks: BHMA A156.11, E07121. Comply with Section 08 71 00 "Door Hardware."
  - 1. Lock cylinders and keying where noted:

## 2.6 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
  - 1. Weld joints and grind smooth.
  - 2. Provide factory-drilled mounting holes.
  - 3. Prepare doors and frames to receive locks.
  - 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
  - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
  - 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

## 2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine roughing-in for cabinets to verify actual locations of piping connections before cabinet installation.

- B. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Existing Hose Reel Cabinets:
  - 1. Examine location of existing cabinets to verify compliance with mounting height acceptable to authorities having jurisdiction.
  - 2. Confirm need to relocate cabinet at a new location, or to refit within current location to become secure and plumb within existing opening and align with proposed wall finish.

### 3.2 PREPARATION

- A. Prepare recesses for recessed and semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

### 3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction, but no higher than the following.
  - 1. Fire-Protection Cabinets Installation height: Install at height conforming to NFPA 10.
    - a. 54 inches above finished floor to top of cabinet.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
  - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
  - 2. Provide inside latch and lock for break-glass panels.
  - 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

### 3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

## SECTION 11 31 10 - APPLIANCES

### 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. Refrigerator (REF-#).
  - 2. Owner Furnished/ Owner Installed Appliances (OFOI)
  - 3. Coordination.
- B. Related Requirements:
  - 1. Section 06 41 00 "Architectural Casework" for coordination of appliances with casework.
  - 2. Division 22 "Plumbing" Sections for appliance domestic water and sanitary connections.
  - 3. Division 26 "Electrical" Sections for appliance power connections.

#### 1.3 COORDINATION

- A. Coordinate locations and requirements of utility service connections.
- B. Coordinate required clearances for all appliances with casework fabricator for cabinets and casework.

#### 1.4 SUBMITTALS

- A. Coordination Drawings: For appliances.
  - 1. Indicate locations of appliances and connections to utilities.
  - 2. Key equipment using same designations as indicated on Drawings.
  - 3. Include plans and elevations; clearance requirements for equipment access and maintenance; details of equipment supports; and utility service characteristics.
- B. Product Schedule: For appliances. Use same designations indicated on Drawings.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility: Where appliances and equipment are indicated to comply with accessibility requirements, comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design, the ABA standards of the Federal agency having jurisdiction, and ICC A117.1.

#### 2.2 MANUFACTURERS

- 1. Basis-of-Design Manufacturer: GE Appliances; [www.geappliances.com](http://www.geappliances.com).

#### 2.3 PRODUCTS

- A. General: Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. Refrigerator, REF-1:
  - 1. Refrigerator, REF-1:
    - a. Basis-of-Design Product: Model no. GBE17HYRFS by GE Appliances.
    - b. Type: ADA Compliant, non-plumbed.
    - c. Capacity: 17.7 Cu. ft.
    - d. Finish: Fingerprint-Resistant Stainless Steel.
    - e. Application: Provide at Coaledo laboratory preparation; or as indicated.
  - 2. Refrigerator, REF-2:
    - a. Basis-of-Design Product: As selected by Architect.
    - b. Type: ADA Compliant, plumbed.
    - c. Finish: As selected by Architect.
    - d. Application: Provide at Coaledo Work Room; or as indicated.
  - 3. Refrigerator, REF-3:
    - a. Basis-of-Design Product: AL54 by Summit Appliance; [www.summitappliance.com](http://www.summitappliance.com).
      - 1) Or approved equal.
    - b. Type: ADA Compliant, plumbed.
    - c. Finish: Stainless steel.
    - d. Application: Provide at Sumner Lab. Prep. Room; or as indicated.
- C. Owner Furnished/ Owner Installed Appliances:
  - 1. Owner shall provide and install countertop appliances as indicated.

## 2.4 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of appliances.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.
- C. Examine walls, ceilings, and roofs for suitable conditions where overhead exhaust hoods will be installed.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install appliances according to manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- D. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
  - 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
  - 3. Operational Test: After installation, start units to confirm proper operation.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- B. An appliance will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain appliances.

END OF SECTION

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## SECTION 11 53 10 - LABORATORY CASEWORK AND OTHER FURNISHINGS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes
  - 1. Wood Laboratory Casework.
  - 2. Metal Laboratory Tables.
  - 3. Cabinet Hardware.
  - 4. Solid surface counterops (SURF-5 and SS-1).
  - 5. Laboratory Work Surfaces.
  - 6. Shelving Assemblies.
  - 7. Benchtop Sleeve/Grommet (Stainless Steel).
  - 8. Plastic Grommets and Other Accessories.
  - 9. Finish for Miscellaneous Wood Items.
  - 10. Metal Fabrications.
  - 11. Slotted Channel Framing (Strut).
  - 12. Sealant.
- B. Related Requirements:
  - 1. Division 09: Flooring (wall base).
  - 2. Division 22: Plumbing
  - 3. Division 23: Heating, Ventilated, and Air Conditioning (HVAC)
  - 4. Division 26: Electrical
  - 5. Division 27: Communications

#### 1.3 REFERENCES

- A. Architectural Woodwork Institute (AWI), Woodwork Institute (WI), and Architectural Woodwork Manufacturers Association of Canada (AWMAC): Architectural Woodwork Standards (AWS), Edition 1, October 2009.
- B. Builders Hardware Manufacturers Association: ANSI/BHMA A156.18-2006 American National Standard for Materials and Finishes, 2006.
- C. Hardwood Plywood & Veneer Association: ANSI/HPVA HP-1-2004 Standard for Hardwood and Decorative Plywood, 2004.
- D. National Hardwood Lumber Association: NHLA Rules for the Measurement & Inspection of Hardwood & Cypress, 2007.
- E. Scientific Equipment and Furniture Association: SEFA 2 Recommended Practices for the Installation of Scientific Laboratory Furniture and Equipment.



- F. Scientific Equipment and Furniture Association: SEFA 3 Recommended Practices for Work Surfaces.
- G. Scientific Equipment and Furniture Association: SEFA 8-W Recommended Practices for Laboratory Grade Wood Casework.
- H. Scientific Equipment and Furniture Association: SEFA 8-M Recommended Practices for Laboratory Grade Metal Casework.
- I. Scientific Equipment and Furniture Association: SEFA 8-PL Recommended Practices for Laboratory Grade Plastic Laminate Casework.
- J. Scientific Equipment and Furniture Association: SEFA 10 Adaptable Laboratory Furniture Systems Recommended Practices.
- K. Underwriters Laboratory: UL61010A-1 Electrical Equipment for Laboratory Use.
- L. United States Green Building Council: USGBC, LEED Reference Guide for Green Building Design and Construction For the Design, Construction, and Major Renovations of Commercial and Institutional Buildings Including Core & Shell and K-12 School Projects.

#### 1.4 BID SUBMITTALS

- A. Certification of Compliance: All bidders (including those listed in 2.01-A) must submit a compliance certification statement indicating that their bid includes products and installation which comply with every requirement of the project specifications and drawings (accounting for any RFI responses received during the bidding phase).
- B. Certification of Qualifications: All bidders must submit a certification of compliance with the Qualifications requirements outlined below. List specific project experience as evidence of compliance.
- C. Substitution Requests: All substitution requests for this scope of work in this section must be made during the bidding phase. No substitution requests will be considered post-bid.

#### 1.5 SUBMITTALS

- A. Refer to General Conditions and Division 1 "Submittal Procedures" for submittal requirements. In addition to these requirements, provide submittal requirements specified herein.
- B. Submittal requirements:
  - 1. Submittal shall be prepared individually for this specification section. Arrange product data, drawings and information for submission in a complete set for this specification section.
  - 2. Submittal shall contain complete data for all items of this specification section. Periodic or partial submittals of individual components within this specification section will be returned as incomplete and rejected.
  - 3. Submittals shall be organized by specification sequence with section and paragraph number identified.
  - 4. Equipment and components being proposed shall be clearly labeled with all options and accessories indicated and shall be for this specific project. All non-applicable items shall be deleted or struck.
  - 5. Product data submittals provided in PDF format shall consist of fully collated PDF files allowing for collated printing from a single file.
  - 6. Shop drawings shall meet the requirements of the Architectural Woodworking Standards (AWS), except in cases where stricter requirements are identified in this section.
- C. Materials List/Product Data: Submit complete materials list, including catalogue data, of all materials, equipment, and products for work in this section.

1. Product data shall not be duplicative or redundant with shop drawings. Do not include drawings in the product data submittal that are included in the shop drawings.
  - D. Shop Drawings: Submit complete shop fabrication and installation drawings, including plans, elevations, sections, details and schedules.
    1. Show relationship to adjoining materials and construction.
    2. Show seaming pattern layout of all joints in work surfaces.
    3. Shop Drawings shall be in the form of reproducible, PDF files, or photocopies, to scale, sheet size not to exceed 11 inches by 17 inches (A3).
    4. Shop drawing submittals provided in PDF format shall consist of fully collated files allowing for collated printing from a single file. Blueline prints are not acceptable.
  - E. Approved Substitution/Approved Equal: In addition to the items required in Division 1, all substitution requests shall include item-by-item comparison of the proposed substitution to this project specification. A copy of the project specification shall be submitted, with each item and subsection of the project specification marked as "Comply" or "Not Comply." In any cases where "Not Comply" is indicated, an explanation of the relative advantages of the proposed design shall be provided.
    1. Substitution shall not affect dimensions shown on Drawings.
    2. The Contractor shall pay for changes to the building design, including engineering design, detailing, utility and service requirements, and construction costs caused by the requested substitution.
    3. Substitutions shall have no adverse effect on other trades, the construction schedule, or specified warranty requirements.
    4. Maintenance and service parts shall be locally available for the proposed substitution.
  - F. LEED Submissions: Provide documentation and certification as required relative to the work of this section to support the project's submission to the USGBC for the credits indicated below.
  - G. Submit detailed anchorage and attachment drawings provided by a licensed Structural Engineer complying with applicable codes, regulations, and guidelines in the state of installation.
  - H. Samples: Accompanying Materials List, submit for Architect's approval two (2) samples of each type of specified finish and color range available for casework, laboratory work surfaces, painted steel fabrications, cabinet hardware, and shelving.
  - I. Certifications/ Test Data: Submit certifications and test data as required elsewhere in this section, including SEFA structural performance test reports, and finish performance test reports.
  - J. Operations/Maintenance Manuals: At project close-out, submit for Architect's review and Owner's use, complete operating and maintenance manuals that describe proper operating procedures, maintenance and replacement schedules, components parts list, and closest factory representative for components and service.
  - K. Warranty: Submit manufacturer's warranty including any additional certifications as needed to meet the requirements specified.
- 1.6 PRODUCT HANDLING
- A. Protection: Use all means necessary to protect work of this section before, during and after installation including installed work and materials of other trades.
  - B. Replacement: Any damaged work shall be replaced, repaired and restored to original condition to the approval of the Architect at no additional cost or inconvenience to the Owner.

1.7 ENVIRONMENTAL CONDITIONS

- A. It is the responsibility of the general contractor or construction manager to provide appropriate environmental conditions within the laboratory spaces throughout the period of installation of wood and composite wood casework products until substantial completion of the project and turnover to the owner. The relative humidity standards as delineated by the Architectural Woodwork Standards should be followed.
  - 1. Humidity must be controlled between 25% and 55% in all areas where laboratory casework is stored and/or installed.
  - 2. The range of relative humidity change should not exceed 30 percentage points.
- B. It is the responsibility of the laboratory furniture subcontractor to assess building environmental conditions prior to the delivery and installation of laboratory casework. Wood laboratory casework shall not, under any circumstances, be installed in spaces which do not comply with the requirements outlined above.

1.8 QUALIFICATIONS

- A. Work in this section shall be manufactured by and installed by a company/companies having a minimum of eight years documented experience providing and installing products similar to those specified in laboratory applications; an established organization; and production facilities including all tools, equipment and special machinery necessary for specializing in the fabrication and installation of the type of products specified, with skilled personnel, factory trained workmen and an experienced engineering department. Each shall have the demonstrated knowledge, ability and the proven capability to produce the specified work of the required quality and the proven capacity to complete an installation of this size and type within the required time limits.

1.9 ENVIRONMENTAL COMPLIANCE

- A. Certified Wood: All wood products used in the fabrication shall comply with the FSC's (Forest Stewardship Council's) Principles and Criteria as required to contribute towards USGBC LEED MR Credit 7.
  - 1. All lumber shall come from forestry sources that are certified under the Forestry Stewardship Council's (FSC) Forest Management Certification program.
  - 2. The casework manufacturer must have FSC Chain-of-Custody (COC) Certification.
  - 3. Documentation:
    - a. Provide manufacturer's Chain of Custody Certification.
    - b. Provide documentation of the cost, volume, and weight of all wood products provided for this project, including any non-FSC wood products or components.
    - c. Provide documentation of the cost, volume, and weight of FSC wood products provided for this project.
    - d. In the case of assemblies where some components are FSC-certified and other components are not – provide separate cost, volume, and weight information for each assembly component.
- B. Low-Emitting Materials – Composite Wood and Agrifiber Products: Composite wood and agrifiber products used in casework products shall contain no added urea-formaldehyde resins, as required to meet USGBC LEED IEQ Credit 4.4.
  - 1. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins.
  - 2. Provide certification as required.

- C. Wood products as listed below shall contain recycled content to contribute towards achievement of the USGBC LEED Green Building Rating System MR Credit 4.
  - 1. Recycled wood products:
    - a. Particleboard plywood cores.
  - 2. The manufacturer shall submit documentation (i.e. "Source of Materials", Invoices, Third Party Validation, etc.) for specified wood products purchased for this project providing recycled content.
    - a. Where assemblies contain both recycled and non-recycled wood products, provide documentation of the weight of recycled wood products relative to the total weight of each assembly.
    - b. Provide documentation of the cost of each component or assembly which contains recycled wood products. Provide percentages (by weight) and costs of post-consumer recycled material and pre-consumer recycled material within each component.
- D. All steel used in the product fabrication shall comply with the recycled steel content requirements to contribute towards achievement of the USGBC LEED Green Building Rating System MR Credit 4.
  - 1. All steel used in the fabrication of laboratory cabinets, fume hoods and modular laboratory systems shall have a minimum of 25% recycled steel content, as defined by ISO 14021-1999, calculated as follows:
  - 2.  $(\% \text{ of Post Consumer Recycled Steel Content by Weight}) + 0.5 \times (\% \text{ of Pre-Consumer Recycled Content by Weight}) \geq 20\% (30\%) (40\%)$
  - 3. Documentation:
    - a. The manufacturer shall submit documentation (i.e. "Source of Materials", Invoices, Third Party Validation, etc.) for steel purchased for this project providing recycled content.
    - b. Provide documentation of the cost of each component which contains recycled steel.
    - c. Provide percentages (by weight) and costs of post-consumer recycled material and pre-consumer recycled material within each component.

#### 1.10 WARRANTY

- A. All products shall be warranted to be free from defects in materials and workmanship for a period of five years following substantial completion. The manufacturer/ dealer/ subcontractor shall repair or replace any products (or parts thereof) that are found to be defective. Replacement will include any parts, labor, shipping, and travel expenses involved. Warranty replacement work must be scheduled in coordination with the Owner's academic/research schedule, and may therefore require evening and/or weekend work.

### PART 2 - PRODUCTS

#### 2.1 WOOD LABORATORY CASEWORK

- A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.
  - 1. CiF Lab Solutions, 53 Courtland Avenue, Vaughan, Ontario, Canada L4K 3T2 Tel: 905 738-5821.
  - 2. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.

3. Mott Manufacturing Ltd., 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825.
  4. Diversified Woodcrafts, Inc., 300 South Krueger Street, Suring, WI 54174 Tel: 920 842-2136.
  5. Pacific Cabinets Inc., 2010 Front Street, Ferdinand, Idaho 83526 Tel: 208 962-5546.
  6. Approved substitution.
- B. Quality Standards:
1. Wood casework shall comply with all requirements of AWS Custom Grade architectural cabinets, unless otherwise specified in this section.
- C. Design Requirements:
1. Door and drawer design: Square edged full flush overlay design with eased edges. Applied panels may be required in areas such as sink cabinets and knee spaces with pencil drawers to complete the flush construction. Reveals shall be within the ranges indicated below; however, they shall be consistent across a given project.
    - a. Reveal from top of door/drawer fronts to top of cabinet: 3/32 inch to 3/8 inch.
    - b. Reveal from bottom of door/drawer fronts to bottom of cabinet bottom panel: Flush.
    - c. Horizontal and vertical reveals between door and drawer fronts: 3/32 inch to 3/16 inch.
    - d. Vertical reveal between side of door and drawer fronts and the side of the cabinet: one-half of the typical horizontal and vertical reveal.
  2. Door and drawer design: Radius edged lipped overlay design with 3/8 inch (10 mm) reveal horizontal and vertical and 7/16 inch (11 mm) vertical reveal on ends of cabinets.
  3. Pulls on doors shall be mounted vertically and on drawers horizontally.
  4. Grain Pattern:
    - a. Vertical Matched Grain Pattern: Grain pattern on all exposed surfaces shall be vertical. Entire cabinet front must be cut from a single panel.
  5. Toe Kicks/ Toe Spaces:
    - a. All tall storage cabinets to have toe space to match base units.
    - b. Provide toe spaces at all fully-exposed sides of cabinets, including locations such as the end of island benches, the end of peninsula benches, and outside-corner cabinets. Toe spaces shall run continuously through all items such as knee opening side panels and end panels.
  6. Full-Flush Construction and Installation: All finished panels and surfaces shall be in the same plane as the front of cabinet doors/drawers to provide a true flush overlay appearance.
    - a. Filler panels: Provide filler panels where casework units meet perpendicular walls to create a continuous appearance.
      - 1) Full-flush end-of-run filler panels are required at all conditions where the joint width is one inch or larger. At conditions where the joint width is less than one inch, filler panel should be flush with cabinet body.
    - b. Flush panels: Provide fixed fully-edgebanded flush panels at sink cabinets, knee opening drawer units, filler panels, and elsewhere, so that all finished panels are in the same plane as cabinet doors and drawers to provide a true flush overlay appearance.

- c. Applied panels may be required in areas such as sink cabinets and knee spaces with pencil drawers to complete the flush construction.
  - d. At outside corners, align side panel of cabinet with the face of the door of adjacent cabinet.
  - e. At inside corners, mount filler panels flush with face of adjacent cabinet doors.
  - f. At open cabinets (without doors), at knee opening side panels, and similar conditions, align face of cabinet with face of adjacent cabinet door. Adjust the depth of the cabinet and toe kick accordingly.
  - g. Align other filler panels and applied panels with face of adjacent cabinet doors.
  - h. Align face of end panels and knee-opening side panels with face of adjacent cabinet doors.
  - i. Provide filler/ trim panels at locations where undercounter dishwashers or glasswashers are shown and the units provided do not completely fill the opening indicated.
  - j. Where knee openings are located against a wall, provide a side/end panel against the wall.
  - k. Filler panels shall follow the profile of toe kicks.
7. Extended Ends:
- a. At end-of-run base cabinets, provide extended end to cabinet to create closure to the wall without the use of filler panels. Extended end shall be edgebanded on front and bottom edges. Back edge shall be scribed to the wall with a tight hairline joint. Field-applied panels do not meet this requirement.
  - b. At ends of island benches and peninsula benches, provide a paired set of base cabinets, each with an extended end, resulting in a single joint. These extended end panels shall be edgebanded on the front and bottom edges and shall meet at a hairline joint. Applied panels do not meet this requirement.
8. Flush interiors: Set cupboard bottom flush with front-end facers. Surface mounted bottoms and offsets caused by front face frames that interfere with ease of cleaning are not acceptable.
9. Widths of drawer bodies in knee opening rails shall not be less than 18 inches (457 mm). As noted above, applied panel shall be provided to complete the flush construction on either side of the drawer head.
- D. Materials and Finishes:
1. Wood:
- a. Definition of cabinet components by surface visibility:
    - 1) Exposed Surfaces:
      - a) Surfaces exposed when doors and drawers are closed.
      - b) Surfaces visible when behind glass doors, including tops and bottoms of shelves.
      - c) All exterior surfaces of suspended casework.
      - d) Open units.
      - e) Bottoms of cabinets if 42 inches (1070 mm) or more above finished floor.
      - f) Tops of cabinets if less than 72 inches (1830 mm) above finished floor.

- g) Front rail of web frames.
    - 2) Semi-exposed surfaces:
      - a) Surfaces that are visible when solid (opaque) doors are open or drawers are extended, including backs of doors.
      - b) Tops of cabinets 72 inches (1830 mm) or more above finished floor when visible from an upper level.
    - 3) Unexposed surfaces:
      - a) Surfaces not normally visible after installation with doors open and drawers extended.
      - b) Bottoms of cabinets less than 30 inches (750 mm) above finished floor.
      - c) Tops of cabinets over 78 inches (1980 mm) above finished floor and not visible from an upper level.
  - b. Wood Species and Veneer Cut: Provide materials that are selected and arranged for compatible grain and color. Do not use materials adjacent to one another that are noticeably dissimilar in color, grain, figure, or natural character markings.
  - c. Oak:
    - 1) Lumber:
      - a) Exposed and semi-exposed: Rift sawn White Oak, NHLA Grade FAS.
      - b) Unexposed: Select grade hardwood of a species suitable for the specified purpose.
      - c) All lumber shall be clean and free of defects; kiln and air dried to uniform moisture content of 6 percent.
    - 2) Veneer:
      - a) Exposed: Rift Sawn White Oak, grade A.
      - b) Color and Matching:
        - 1). 100% sapwood, no heartwood allowed.
        - 2). Slight color streaks or marks.
        - 3). Slight color variation.
        - 4). No sharp contrast at veneer joints.
      - c) Natural Characteristics:
        - 1). Small conspicuous burls and pin knots: combined average not to exceed 4 per 10 square feet (1 m<sup>2</sup>).
        - 2). Conspicuous burl size: 3/8 inch (9.5 mm), maximum.
        - 3). Pin knot size, dark part: 1/8 inch (3.2 mm), maximum.
        - 4). Pin knot size, total: 1/4 inch (6.4 mm), maximum.
        - 5). Slight cross bars allowed.
      - d) Manufacturing Characteristics:
        - 1). Rough cut or ruptured grain is not allowed.
        - 2). Blended repaired tapering hairline Splits: two 1/16 inch (1.6 mm) x 6 inch (152 mm) on end panels only.
        - 3). Repairs: Very small blending allowed.
      - e) Veneer shall be hand selected for uniformity of color and grain prior to fabrication of cabinet faces. The resulting selection shall provide a pleasing uniform appearance and shall not allow darker and lighter panels in the same area or room after installation.

- f) Flitch Width, Face Components: 3 inches minimum, except for outside components.
  - g) Semi-Exposed: Rift Sawn White Oak Grade B.
  - h) Unexposed: Plain sliced hardwood veneer.
  - i) Layup pattern: Book matched.
- 2. Plywood
  - a. Typical, Unless Otherwise Noted: Hardwood Veneer Plywood
    - 1) Product shall be provided with hardwood face veneers as specified above.
    - 2) Plies:
      - a)  $\frac{3}{4}$  inch (19 mm): minimum 7-ply, including face veneers.
      - b) 1 inch (25 mm): minimum 9-ply, including face veneer.
    - 3) Physical Properties:
      - a) Screwholding: 355 lb at face.
      - b) Average modulus of rupture: 7346 psi (50.65 N/mm<sup>2</sup>).
  - b. Drawer and Door Fronts: ANSI A208.1 M3 Grade Industrial Particleboard Core Plywood.
    - 1) Product shall be provided with hardwood face veneers as specified above.
    - 2) Plies:
      - a) 3-ply, including face veneers.
    - 3) Minimum Physical Properties:
      - a) Screwholding: 247 lbs at face, 225 pounds at edge.
      - b) Average modulus of rupture: 2,393 lb/in<sup>2</sup>.
      - c) Modulus of elasticity: 398,900 lb/in<sup>2</sup>.
      - d) Hardness: 500 lbs.
  - c. Drawer box back, front and sides: Finnish or Baltic Birch Plywood
- 3. Hardboard: Dry process S2S hardboard made from compressed exploded wood fibers.
- 4. Edgeband/Facer: 1/8 inch (3 mm) hardwood; species as described above.
- 5. Dowels: 8 mm, diameter, minimum, hardwood, laterally fluted with chamfered ends.
- 6. Glue: Type 2 or Type 3 water resistant glue with gluing done in clamps and jigs.
- 7. Finish for Wood Laboratory Components:
  - a. All wood components shall be fully sanded on all surfaces including the underside of exposed components, glazed door element inside edges, penetrations for the attachment of drawer heads, screws attaching adjacent cabinets, cutouts at grilles, and all other such locations. The final installation shall present no rough, splintered, or unfinished surfaces at any visible, exposed, semi-exposed, or touchable locations. This does not apply to components of surfaces which will be fully concealed in the final installation.
  - b. Finish processes (stains and finishes) shall be by means of compression spray or a UV roll coater, providing high-transfer efficiency low waste generation. Solvent applied coatings are not acceptable and will not be considered. Manufacturer shall



supply documentation that waste generated during the finishing process, is a non-hazardous material, eliminating liquid waste disposal in landfills.

- 1) Chemically Resistance Finish: Finish for all wood products shall be environmentally friendly, highly chemically resistant, water-borne, laboratory-grade finish that satisfies the requirements specified herein for chemical and durability resistance. A letter from a third-party validator, verifying independent test results, shall be submitted.
- 2) Operator Protection: The application shall be convenient and easily mastered, in a custom spray booth. The finish process shall be cleanly contained and shall have no solvent odor, and shall be applied in an air-conditioned room.
- 3) VOC Emissions: Water-borne finishes shall be sprayed and cured with a near zero (2.0 lbs. per gallon for 'clean finish') VOC (Volatile Organic Compounds) emissions.
- 4) Offgasing: After all wood products have cooled from the curing ovens, the coating shall be firm and stable. No further emissions or "Offgasing/Decomposition" vapors shall occur at room temperature.

c. Manufacturer may use either of the following finish systems:

- 1) Customized, high-solids, cross-linked, ultraviolet light (UV)-cured coating developed for durability, including abrasion, chemical, impact, and scratch resistance, for flat-line applications. Coatings shall have little or no VOCs.
- 2) Chemical-resistant modified acrylic urethane finish with built-in UV blocker, or equal, applied over permanent wood stain.

d. Stain Color:

- 1) To be selected by Architect from manufacturer's full published color range.

e. Application:

- 1) Finish application and sequence shall be as recommended and designed by the manufacturer for a high quality, laboratory-grade wood casework finish.
- 2) Preparation: Sand exposed and semi-exposed surfaces smooth, free from dirt and defects.
- 3) Stain application: Apply stain of color selected to all exposed and semi-exposed casework surfaces. Apply in a manner to achieve a match with the selected color sample upon completion of application of the finish.
- 4) Finish application: Apply chemical resistant top finish to all stained surfaces. Apply to doors after any notching for hinges has been performed. Finished surfaces shall be even, water-clear and bright. Cloudy or muddy finishes carrying tinting pigments will not be acceptable.

8. Glass: Framed glass doors:

- a. 1/8 inch (3mm) to 7/32 inch (5.5 mm) nominal tempered glass.
- b. Without imperfections or marred surfaces.
- c. All glass should have etched safety information, readable from outside the cabinet.

E. Construction:

1. Base Cabinets:

- a. Assembly: Dowel and/or mortise-and-tenon joinery secured with countersunk screws and pressure-glued.

- b. Cabinet Top:
  - 1) Front rail of  $\frac{3}{4}$  inch plywood x  $2\frac{1}{4}$  inches (57 mm) or 1 inch (25 mm) x 3 inches (76 mm) hardwood. Back rail:  $\frac{3}{4}$  inch plywood or hardwood, 3- $\frac{3}{4}$  inches tall.
  - 2) Side panels and end panels: edgeband front edge and bottom edge.
- c. Cabinet Backs, Exposed to View from the Inside at Open Units and Units with Glazed Doors:  $\frac{1}{4}$  inch (19 mm) thick veneer core plywood.
- d. Cabinet Back, Semi-Exposed and Unexposed:
  - 1) Removable hardboard,  $\frac{1}{4}$  inch (6 mm) thick.
  - 2) Sink base back shall be half-height construction to allow for plumbing and sink waste connection.
  - 3) Provide split back on drawer cabinets.
- e. Cabinet Base:  $3\frac{3}{4}$  inches (95 mm) x  $\frac{3}{4}$  inch (19 mm) front hardwood or veneer core plywood toe space rail, mounted between end panels, forming a 4 inch (102 mm) high x  $2\frac{1}{2}$  inch (63 mm) deep toe space, closed to cupboard bottom. Secure rails to cabinet end panels.
  - 1) Front edge of shelves shall be edgebanded.
  - 2) Shelf Adjustment: All shelves shall be adjustable on 32 mm centers.
  - 3) Shelf Tolerance: Shelves shall fit into cabinets or into shelf supports with a tolerance of  $\frac{1}{16}$  inch per side maximum.
- f. Drawer construction:
  - 1) Drawer box back, front and sides shall be of  $\frac{1}{2}$  inch (13 mm), 9-ply Finnish or Baltic Birch veneer plywood, with eased top edge, finished with a Gloss Level 7 polyester acrylic finish. The top edges of the completed drawer bodies shall be very smooth to the touch and shall not present any rough or splintered surfaces. Sides shall be full height with 1 inch (25 mm) clearance to frame opening. Drawers shall be a minimum of 18 inches front to back.
  - 2) Acceptable drawer joinery options:
    - a) Dowel: Glued under pressure; 32mm, minimum, dowel spacing to 4 inches (102 mm) high, 64 mm dowel spacing above 4 inches (102 mm).
    - b) Multiple Dovetail: Tight fitting and glued.
  - 3) Drawer bottom shall be Baltic Birch veneer plywood. Bottom shall be grooved into the 4 sided drawer box and sealed with hot melt glue process around entire drawer bottom perimeter.
    - a) Drawers up to 24 inches wide:  $\frac{3}{8}$  inch (9mm) thick 7-ply Baltic Birch veneer plywood.
    - b) Drawers greater than 24 inches wide:  $\frac{1}{2}$  inch (13 mm) thick 9-Ply Baltic Birch veneer plywood.
- g. Door and Drawer Heads: shall be  $\frac{3}{4}$  inch (19 mm) thick plywood with edgebanding. Edges shall be as specified previously in this section. Drawer heads shall be screwed to drawer box.
- h. Flush Panels: As described in the Design Requirements section of this specification.
- i. Vertical Dividers: Full height dividers shall be  $1\frac{1}{2}$  inch (38 mm) thick plywood. Edgeband exposed edge.

- j. Front Horizontal intermediate Rail:  $\frac{3}{4}$  inch (19 mm) x  $1\frac{1}{2}$  inches (38 mm) exposed hardwood rail shall be provided between doors and drawers. For all drawer units at benches where service fitting connections are not accessible via an adjacent knee opening filler or cabinet filler panel, drawer units to be provided with Keku fasteners (Keku fasteners not required at other locations). The drawer unit intermediate horizontal and vertical box frames must be removable. These components shall be assembled with Keku suspension fittings as manufactured by Häfele America Co. or approved so these members are easily removable at any time with no special tools to gain access to concealed piped services behind.
  - k. Intermediate Back Rail:  $1\frac{1}{2}$  inch (38 mm) x  $\frac{3}{4}$  inch (19 mm) hardwood lumber to accept hardboard security panel between drawers.
  - l. Security Panels: Provide hardboard security panels,  $\frac{1}{8}$  inch (3 mm) thick, in frames when keyed-different locks are specified, or where individual padlock hasps are indicated. Inset security panel into frame on all four sides.
2. Wall, upper and tall cases:
- a. Shall be manufactured with materials and joinery methods as specified for base units, unless otherwise indicated.
  - b. Edgebanding:
    - 1) Wall cabinets side panels: Edgeband front and bottom edges. Wall cabinet end panels: Edgeband front, bottom, and top edges.
    - 2) Edgeband front and top edges of upper cabinet side and end panels.
    - 3) Edgeband front, top, and bottom edges of tall cabinet side and end panels.
  - c. Cabinet Interior Backs:  $\frac{1}{4}$  inch thick veneer core plywood, typical for all exposed, and semi-exposed interior backs.
  - d. Hardwood plywood tops: 1 inch (25 mm) thick with front edge edgebanded.
  - e. Wall and upper case hardwood plywood bottoms: 1 inch (25 mm) thick. Tall case hardwood plywood bottoms  $\frac{3}{4}$  inch (19 mm) thick. Edgeband front edges.
  - f. Bottom hardwood kick rail on tall cases:  $3\frac{3}{4}$  inches (95 mm) x  $\frac{3}{4}$  inch (19 mm) front hardwood or veneer core plywood toe space rail, mounted between end panels, forming a 4 inch (102 mm) high x  $2\frac{1}{2}$  inch (63 mm) deep toe space, closed to cupboard bottom. Secure rails to cabinet end panels.
  - g. Solid doors shall be the same construction as specified for base cabinets.
  - h. Framed-glazed doors: Hardwood construction,  $\frac{3}{4}$  inch (19 mm) x  $2\frac{3}{4}$  inch (70 mm) machined to accept glass. Ease all edges, interior and exterior, including those that frame the glazing. Provide extruded vinyl retaining molding on interior designed so glass can be replaced without tools
  - i. Shelves: 1 inch (25 mm) thick full depth, 9-ply hardwood plywood. Full-depth is defined as a shelf whose front edge is within  $\frac{1}{2}$  inch (13mm) of the face of the cabinet when the shelf is fully back in the cabinet.
    - 1) Front edge of shelves shall be edgebanded.
    - 2) Front edge of open shelves:
      - a) Retainer Rail: Retainer rail as specified elsewhere in this section and detailed on drawings.
    - 3) Shelf adjustment:
      - a) Wall units: All shelves shall be adjustable on 32 mm centers.

- b) General purpose tall units: One fixed shelf. All others shall be adjustable on 32 mm centers.
- 3. Aprons and leg assemblies:
  - a. Apron: Unless otherwise noted, not less than  $\frac{3}{4}$  inch (19 mm) x 4-5/16 inch (110 mm) hardwood.
  - b. Legs: Not less than 2 inch (50 mm) x 2 inch (50 mm) hardwood.
  - c. Leg rails: Not less than 1 $\frac{1}{4}$  inch (32 mm) x 2 $\frac{1}{2}$  inch (63 mm) hardwood.
  - d. All exposed edges of legs and aprons shall be eased, sanded smooth, and finished per requirements described above for wood laboratory casework components.
- 4. Wood Casework Construction Performance:
  - a. Base cabinets shall be constructed to support a uniformly distributed load of 200 lbs. minimum per square foot (1000 kg/m<sup>2</sup>) of cabinet top area (total maximum of 2000 lbs. (900 kg)), including working surface, without permanent distortion or interference with door and drawer operation.
  - b. Base cabinets shall be constructed so that when supported on both back corners and one front corner; with a counterweight load of 350 pounds placed on the rear corner behind the supported front corner; and with a load of 200 pounds placed on the unsupported corner – there shall be no permanent damage after 24 hours of loading. Maximum allowable deflection shall not exceed 1/8 inch.
  - c. Swinging doors mounted on base units shall support a 200 lb. (113 kg) load located at a test point 12 inches (305 mm) measured horizontally from hinge along the top edge of door through a swing of 160 degrees. Weight test shall allow nominal temporary deflection, but no permanent distortion. Door assembly shall be twist-resistant and rigid, and shall close in a flat plane against the cabinet to permit the door catch at top of door to function properly.
  - d. Drawers shall be constructed so that they will support a 150 pound load hung on the drawer head centerline, with the drawer opened 13 inches (330mm), for five minutes. There shall be no interference with the normal operation of the drawer and the drawer head should remain tightly fastened to the drawer.
  - e. Drawers shall be constructed so that a drawer that is removed and supported on four corners will support a 10 pound sand or shot bag dropped from a height of 24 inches (610mm) without damage.
  - f. Drawers shall be constructed so that a drawer that is removed and supported at a 45 degree angle shall be capable of withstanding three impacts of a 2 inch (51mm) diameter, 12 inch (305mm) long steel rod (approximately 10 pounds in weight) released from 13 inches (330mm) from the front and back of the drawer. The drawer joinery shall remain intact and the drawer shall operate normally when placed back into the casework cabinet.
  - g. Drawer mechanical suspension systems shall be designed and attached to that a drawer uniformly loaded with 75 pounds of sand or shot bags shall operate freely without binding over its full range for 50,000 cycles at a rate not exceeding 10 cycles per minute. The force required to open and close the loaded drawer for the purposes of this test shall not exceed 8 pounds.
  - h. Shelves shall be designed and supported to that they can support a load of 40 pounds per square foot, up to a maximum of 200 pounds per shelf, for 24 hours with no more than 0.35 inches (9mm) of deflection maximum.
- F. Hardware: As specified elsewhere in this Section.
- G. Wood Finish Chemical Resistance Performance Requirements:

1. Manufacturer shall submit wood finish chemical resistance performance test results. Testing to be performed by independent testing agency.
2. Procedure: Place panel on a flat surface, clean with soap and water and blot dry. Condition the panel for 48-hours at 73° +/- 3°F (23° +/- 2°C) and 50 +/- 5% relative humidity or the currently accepted guideline set by ASTM. Test the panel for chemical resistance using forty-nine different chemical reagents by one of the following methods. For both methods, leave the reagents on the panel for a period of one hour. Wash off the panel with water, clean with detergent and naphtha, and rinse with deionized water. Dry with a towel and evaluate after 24-hours at 73° +/- 3°F (23° +/- 2°C) and 50 +/- 5% relative humidity, or the currently accepted guideline set by ASTM.
  - a. Method A: Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a 1 ounce (29.574cc) bottle and inverting the bottle on the surface of the panel.
  - b. Method B: Test non-volatile chemicals by placing five drops of the reagent on the surface of the panel and covering with a 24mm watch glass, concave side down.
3. Rating System: Evaluations shall use the following rating system:

Level 0	No detectable change.
Level 1	Slight change in color or gloss.
Level 2	Slight surface etching or severe staining.
Level 3	Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.
4. Acceptance Level:
  - a. Individual test results for the specified 49 reagents shall be within the Range for that reagent as specified on the table below.
  - b. There shall be no more than four (4) Level 3 conditions.
5. Table of reagents:

Test No.	Chemical Reagent	Test Method	Range
1.	Acetate, Amyl	A	0-1
2.	Acetate, Ethyl	A	0-1
3.	Acetic Acid, 98%	B	0-1
4.	Acetone	A	0
5.	Acid Dichromate, 5%	B	0-1
6.	Alcohol, Butyl	A	0-1
7.	Alcohol, Ethyl	A	0
8.	Alcohol, Methyl	A	0-1
9.	Ammonium Hydroxide, 28%	B	0-2
10.	Benzene	A	0-1
11.	Carbon Tetrachloride	A	0-1
12.	Chloroform	A	0
13.	Chromic Acid, 60%	B	0-1
14.	Cresol	A	0-2
15.	Dichloroacetic Acid	A	0-3
16.	Dimethylformamide	A	0-2
17.	Dioxane	A	0-1
18.	Ethyl Ether	A	0-1
19.	Formaldehyde, 37%	A	0
20.	Formic Acid, 90%	B	0-1
21.	Furfural	A	0-1
22.	Gasoline	A	0
23.	Hydrofluoric Acid, 37%	B	0-2
24.	Hydrofluoric Acid, 48%	B	0-2

Test No.	Chemical Reagent	Test Method	Range
25.	Hydrogen Peroxide, 30%	B	0-1
26.	Iodine, Tincture of	B	0-2
27.	Methyl Ethyl Ketone	A	0
28.	Methylene Chloride	A	0-1
29.	Monochlorobenzene	A	0-1
30.	Naphthalene	A	0
31.	Nitric Acid, 20%	B	0
32.	Nitric Acid, 30%	B	0-2
33.	Nitric Acid, 70%	B	2-3
34.	Phenol, 90%	A	0-2
35.	Phosphoric Acid, 85%	B	0-1
36.	Silver Nitrate Saturated	B	0-1
37.	Sodium Hydroxide 10%	B	0-2
38.	Sodium Hydroxide 20%	B	0-2
39.	Sodium Hydroxide 40%	B	0-2
40.	Sodium Hydroxide Flake	B	0
41.	Sodium Sulfide Saturated	B	0
42.	Sulfuric Acid, 33%	B	0-1
43.	Sulfuric Acid, 77%	B	0-1
44.	Sulfuric Acid, 96%	B	1-3
45.	Sulfuric Acid 77% & Nitric Acid 70% equal parts	B	1-3
46.	Toluene	A	0
47.	Trichloroethylene	A	0
48.	Xylene	A	0
49.	Zinc Chloride, Saturated	B	0

## 2.2 METAL LABORATORY TABLES

- A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer. Corrosive and flammable liquid/solvent storage cabinets may also be provided by the manufacturers listed with their descriptions.

### 1. Laboratory Casework:

- Air Master Systems, 6480 Norton Center Drive, Muskegon, MI 49441 Tel 231 798-1111.
- Bedcolab Ltd, 2305 Francis Hughes Avenue, Laval, Quebec, Canada H7S 1H5 Tel 514 384-2820.
- CiF Lab Solutions, 53 Courtland Avenue, Vaughan, Ontario, Canada L4K 3T2 Tel: 905 738-5821.
- ICIsScientific, 1865 Highway 641 North, Paris, TN 38242-8814 Tel: 731-642-4251.
- Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.
- Mott Manufacturing Ltd., 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825
- Approved substitution.

### 2. Metal-Framed Laboratory Tables

- Tops: Refer to Laboratory Furnishing drawings for top materials, as described in the Laboratory Work Surfaces section.

- 1) Tops shall be mechanically attached to the table frame with a minimum of six concealed metal angle brackets screwed into the inside of the table frame and the bottom of the work surface. Metal angle bracket may be stainless steel, zinc-coated steel, or powder-coated steel. Screws shall be dome-head, with a minimum size of No. 5, ½ inch long, or otherwise sufficient to firmly and permanently secure the benchtop to the table frame allowing that the table may be picked up by the top.
- 2) Vibration absorbing isolation: Provide a continuous wide bead of clear silicone sealant to the top of all supporting rails. Allow complete cure before attachment of the work surface.
- b. Electrical receptacles: Tables shown with electrical receptacles shall be pre-wired, including cutouts for electrical receptacles, black cord, straight plug configuration NEMA 5-20P plug, back boxes, NEMA 5-20R decora-style electrical receptacles, color to match standard power receptacles in the laboratories as indicated in Division 26, stainless steel faceplates, wiring, and junction boxes as required for a complete functional assembly.
  - 1) The first electrical device wired from the main cord shall be a 20 amp, GFCI outlet with downstream protection capability.
  - 2) Ensure wiring to downstream receptacles is connected to the downstream outlets such that GFCI protection is provided to downstream outlets.
  - 3) Cover plates of downstream outlets to be engraved to note that GFCI protection is provided via upstream receptacle.
  - 4) UL Listing:
    - a) The table assembly shall be UL61010A-1 tested and labeled.
- c. Leveling Glides and Leg Shoes:
  - 1) Each leg other than those fitted with casters shall have leveling glides: (2 inch) (48 mm) diameter, two-piece pivot construction, steel housing, non-marring, phenolic or translucent plastic insert, (1/2 inch) (12 mm) diameter, minimum (1 1/2 inch) (36 mm) long zinc plated stems. Each glide shall have a load bearing capacity of 150 lbs.
  - 2) Each leg other than those fitted with casters and adjustable-height legs, shall have leg shoes: Black coved vinyl or rubber leg shoe, 2 inches (50 mm) in height.
- d. Casters: Where indicated on Laboratory Furnishing drawings, provide sets of 3 ½ inch (89 mm) diameter wheels with self-lubricating bearing, rated to carry 250 pounds (113 kg) minimum each. Each caster must swivel and have a locking brake at front wheels. Wheel shall be of molded polyurethane tread mechanically locked to a polyolefin core. Movable tables to have all 4 swivel and locking casters.
- e. Construction:
  - 1) Table rails, legs, and spreader rails shall be fully welded into a single-piece table frame structure. No mechanical joints between members are permitted.
- f. Rails: Unless otherwise noted, not less than 1½ inch x 4½ inch 16 gauge (38 x 114 x 1.6 mm) channel steel sections, reinforced as necessary for leg attachment.
- g. Legs: Not less than 2 inch x 2 inch 16 gauge (50 x 50 x 1.6 mm) square tubular steel sections.
- h. Materials and Finish: Refer to Metal Fabrications specifications in this Section for material and finish requirements.

3. Aprons and leg assemblies:
  - a. Apron: Unless otherwise noted, not less than 1½ inch (38 mm) x 4 inch (114 mm) 16 gauge (x 1.6 mm thick) channel steel sections, reinforced as necessary for leg attachment.
  - b. Legs: Not less than 2 inch (50 mm) x 2 inch (50 mm) 16 gauge (x 1.6 mm thick) square tubular steel sections.
  - c. Leg rails: Not less than 1¼ inch (32 mm) x 2½ inch (63 mm) 16 gauge (x 1.6 mm thick) steel sections, reinforced as necessary for leg attachment. Each leg shall have a recessed leveling screw and a black, coved vinyl or rubber leg shoe, 2 inches (50 mm) in height.

## 2.3 CABINET HARDWARE

- A. General: Special cabinets, such as corrosives storage, flammable liquid and solvent storage, rock storage, map storage, museum storage, radioisotope storage, and narcotics lockers, may be provided with the manufacturer's standard hardware.
  1. All door and drawer pulls shall match, regardless of type of casework, except for:
    - a. Flammable liquid/ solvent storage cabinets, which should use manufacturer's standard latch handles as required to satisfy requirements of regulatory approvals.
  2. All hardware shall be compliant with the ADA Standards for Accessible Design (28 CFR Part 36).
- B. Drawer and Hinged Door Pulls:
  1. Drawer and door pulls shall attach to door or drawer with machine screws. Two (2) pulls shall be furnished on drawers wider than 28 inches (711 mm). Plastic pulls or other types subject to breakage are not acceptable.
  2. Type: Pulls shall be round "wire."
    - a. Material and Finish:
      - 1) Stainless steel with finish as follows:
        - a) BHMA 630 Satin (Previously US32D).
- C. Hinges:
  1. General: Hinges shall be attached to both door and case with three screws through each leaf. Provide two hinges for doors up to 48 inches (1219 mm) high; three hinges for doors over 48 inches (1219 mm) high.
  2. Type: Institutional with a five-knuckle bullet-type barrel. Characteristics:
    - a. Height: 2½ inches (63 mm), nominal.
    - b. Material: Stainless steel with stainless steel screws.
      - 1) Finish:
        - a) BHMA 630 Satin (Previously US32D).
      - 2) Manufacturers:
        - a) Rockford Process Control, Inc. 202 Seventh St., Rockford, IL 61104  
Tel: 81 5 966-2000.
        - b) Approved substitution.
- D. Shelf Hardware:
  1. Shelf Supports:



- a. Adjustable shelf supports: Adjustable clear plastic shelf support with lockdown clips.
- 2. Manufacturers:
  - a. Bainbridge Manufacturing, Inc., P. O. Box 487, 237 W 3<sup>rd</sup>, Waterville, WA 98858 Tel: 800 255-4702.
  - b. The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.
  - c. Knappe & Vogt Manufacturing CO., 2700 Oak Industrial Dr. NE, Grand Rapids, MI 49505 Tel: 616 459-7620.
  - d. Sugatsune America, Inc. 221 East Selandia Lane, Carson, CA 90746 Tel: 310 329-6373.
  - e. Approved substitution.
- E. Catches:
  - 1. Roller Catches:
    - a. Types and Materials: Roller catches shall be one of the following types. All-plastic or knuckle-type catches are not acceptable, except at corrosive storage cabinets.
      - 1) Tension ball catches consisting of a case with an adjustable-tension ball catch and a matching strike. Components shall be either stainless steel, chrome plated zinc alloy, or chrome-plated brass.
      - 2) Nylon roller housed in a steel case, which catches on a steel strike plate. Steel components shall be zinc finished.
      - 3) At metal casework base cupboard, catches may consist of a two-piece heavy-duty cam action positive catch positioned near the pivoting edge of door which provides a clean unobstructed opening. Main body of the catch shall be confined within an integral cabinet divider rail, while latching post shall be mounted on the hinge side of door.
      - 4) At corrosive storage cabinets, catches shall be non-metallic.
    - b. Application: Provide roller catches at all cabinet doors without elbow catches or as indicated.
      - 1) Unless otherwise indicated, at wall and base cabinets, locate roller catches at top of door.
      - 2) Unless otherwise indicated, at tall cabinets, locate roller catches at fixed center shelf.
    - c. Manufacturers:
      - 1) The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.
      - 2) Sugatsune America, Inc. 221 East Selandia Lane, Carson, CA 90746 Tel: 310 329-6373.
      - 3) Approved substitution.
  - 2. Elbow catches: Heavy-duty, adjustable, spring-type elbow catch and strike plate.
    - a. Material: Brass or steel with bright chromium plated finish.
    - b. Application: Elbow catches shall be used on left hand doors of locked double door cabinets, including tall cabinets.

- 1) At tall cabinets, elbow catch shall latch to fixed center shelf. Latching devices using chains or strings are not acceptable.
  - c. Manufacturers:
    - 1) The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.
    - 2) Approved substitution.
- F. Drawer slides:
  1. Typical: Ball bearing slides:
    - a. Material:
      - 1) Clear, zinc-coated steel.
    - b. Full extension, 100 lb/pr. (45 kg/pr.) capacity: Accuride 3832, Fulterer FR5000, or equal.
    - c. File drawers shall be equipped with rail mounted with overtravel, 150 lb/pr. (68 kg/pr.) capacity: Accuride 4034, Fulterer 5755, or equal.
- G. Drawer Stops: All regular drawers shall be equipped with integral stops to prevent drawer head impact with cabinet body.
- H. Door Stops: Provide door stops for any cabinet door, which will strike an obstruction when opened between 90 and 135 degrees.
  1. Stop to be either:
    - a. Sash chain, No. 30 zinc-plated steel.
      - 1) Terminations: Zinc chromate wire screw eyes. Open eye as required to attach stop with screws. Through-bolting not allowed.
    - b. Coated cable.
      - 1) Seven-strand, 7-wire-per-strand, stainless steel cable with clear nylon coating.
      - 2) Wire diameter: 0.047 inches.
      - 3) Composite diameter with coating: 0.063 inches.
      - 4) Terminations: Number 10 stake eye on both ends. Attach to door/cabinet with screws. Through-bolting not allowed.
      - 5) McMaster Carr part number 30345T3 or equivalent.
  2. Engineer stop to length to allow door to open 1 ½ inch (40 mm) from obstruction.
- I. Hanging File Suspension System: Hangers shall be fastened and secured to drawer construction and shall not be freestanding units set inside the drawer. Provide in all file drawers.
  1. Basis of Design: Blum Metafile Hanging File Frame Kit.
  2. Manufacturers:
    - a. Julius Blum, Inc. 7733 Old Plank Rd., Stanley, NC 28164 Tel: 800 438-6788.
    - b. Hettich America L. P., 6225 Shiloh Rd., Alpharetta, GA 30005 Tel: 800 438-8424.
    - c. Approved substitution.
- J. Label holders: Provide label holders, pinned in place. Stick-on holders not acceptable. Label holders shall be provided at all file drawers, and elsewhere as shown on drawings.
  1. Size:

- a. Minimum Size: 1 inch (25mm) by 2 inches (50mm)
    - b. Maximum Size: 2 inches (50mm) by 3 ½ inches (90mm)
  2. Material and finish:
    - a. Steel with matt chrome finish.
  3. Basis of Design Product:
    - a. 704ANO Label Holder by Knappe & Voght, 2700 Oak Industrial Drive NE, Grand Rapids, MI 49505 Tel: 800 253-1561.
    - b. Approved substitution.
- K. Number Plates: Provide 5/8 inch (16 mm) by 1 ¼ inches (32 mm) aluminum number plates with black numbers, pinned in place. Stick-on holders not acceptable. Number plates shall be provided at all drawers where indicated on the plans. Number drawers sequentially in each laboratory.
- L. Locks:
  1. General: Provide locks on all file cabinet drawers. Provide locks at other locations as indicated on the drawings.
  2. Lock type: Deadbolt-type lock.
    - a. Disc-tumbler-type locks and/or cam-type locks will not be accepted.
    - b. Framed sliding door locks shall be plunger type.
    - c. Refer to Elbow Catches section, above, for requirements at two-swinging-door cabinets.
  3. Testing requirements:
    - a. Locks shall comply with ANSI/BHMA standard E07121.
    - b. Lock shall be cycle tested per ANSI/BHMA A156.11 Grade 1.
  4. Include spacers, adapters, fasteners, and strikes.
    - a. All locks shall strike into metal material. Striking directly into wood is not acceptable.
  5. Barrel length shall be coordinated with specific conditions.
  6. Finish: Locks shall have satin nickel or satin chrome finish.
  7. Keying:
    - a. Key quantities: Provide two keys per lock. Provide four copies of any master/ grand master keys.
    - b. Key system:
      - 1) Key system shall support a minimum of 2000 different keys.
      - 2) Key system shall support up to three levels of master keys (grand-master keys, master keys, and sub-master keys) in addition to individual keys.
    - c. Key cylinder type:
      - 1) Coordinate key type with owner.
    - d. Key schedule: Coordinate key schedule with Owner.
  8. Key engraving:
    - a. Keys to be engraved with an identification number corresponding to the layout of unique keys on the project. All identical keys shall be engraved with the same number.

- b. At laboratories with multiple, individually-locked drawers where number plates are indicated, engrave each key with number to match the number plate on each drawer.
- 9. Manufacturers:
  - a. Swinging Doors and Drawers:
    - 1) Illinois Lock Company, 301 West Hintz Rd., Wheeling, IL 60090 Tel: 847 537-1800.
    - 2) National Cabinet Lock, 200 Old Mill Rd., P. O. Box 200, Mauldin, South Carolina 29662 Tel: 864 297-6655.
    - 3) Olympus Lock, Inc. 18424 Highway 99, Lynnwood, Washington 98037 Tel: 206 362-3290.
    - 4) Approved substitution.
- M. Padlock Hasps: Provide one of the following:
  - 1. Stainless steel padlock-eye cam-type locking device and strike plate at cabinet locations as indicated on the drawings. Strike plate, or protection plate, shall be large enough to prevent padlock from damaging door or drawer front.
  - 2. Barrel-style cam-type padlock hasp sized to fit standard lock cylinder hole with finish to match drawer pulls, and strike plate at cabinet locations as indicated on the drawings. Strike plate, or protection plate, shall be large enough to prevent padlock from damaging door or drawer front.
  - 3. Cam-lock shall engage or strike into a metal casting.
  - 4. Manufacturers:
    - a. Northeast Lock Corporation, 48 Oak St., Clifton, NJ 07014 Tel: 800 524-2575.
    - b. Olympus Lock, Inc. 18424 Highway 99, Lynnwood, Washington 98037 Tel: 206 362-3290.
    - c. Rockford Process Control, Inc. 202 Seventh St., Rockford, IL 61104 Tel: 815 966-2000.
    - d. Approved substitution.
- N. Glides: Non-marring material, 1 inch (25 mm) diameter, minimum, with at least 5/8 (16 mm) vertical adjustment. Provide on movable tables, unless otherwise indicated.
- O. Leveling devices: Provide each table leg with 3/8 inch (10 mm) minimum diameter leveling bolt and floor clip.
- P. Leg shoes: Leg shoes shall be provided on all legs and table legs to conceal leveling devices, except for tables with casters. Shoes shall be 2 ½ (63 mm) inch high and of black rubber or pliable black vinyl material. Use of a leg shoe which does not conceal leveling device is not acceptable.
- Q. Floor clips: Provide leg assemblies and fixed table legs with floor clips securely fastened to the floor after shimming.
- R. Casters: Where indicated on Laboratory Furnishing drawings, provide sets of 3 ½ inch (89 mm) diameter wheels with self-lubricating bearing, rated to carry 250 pounds (113 kg) minimum each. Each caster must swivel and have a locking brake. Wheel shall be of molded polyurethane tread mechanically locked to a polyolefin core.
  - 1. Material: Caster shall be heavy gauge cold rolled steel with bright zinc plating.
  - 2. Manufacturers:
    - a. Acorn Industrial Products Co., 7 Union Hill Dr., W. Conshohocken, PA 19428 Tel: 800 523-5474.

- b. Caster Technology Corporation, 3265 Whipple Rd., Union City, CA 94587, Tel: 510 429-6727.
  - c. Hamilton Caster & Mfg. Co., 1637 Dixie Highway, Hamilton, OH 45011 Tel: 888 699-7164.
  - d. Approved substitution.
- S. Support Struts and Service Leding: Refer to specifications for slotted channel framing in this Section.

## 2.4 SOLID SURFACE COUNTERTOP

- 1. Epoxy resin countertop, fabricated according to manufacturer's written instructions and the AWI's "Architectural Woodwork Standards."
  - 1) Basis-of-Design Product: SURF-5: Model no. SOLI-4X4-H11-4 by Durcon a division of Wilsonart Company; [www.durcon.com](http://www.durcon.com).
    - a) Color: "Graphite".
    - b) Finish: Manufacturer's standard.
    - c) Thickness: As indicated.
  - 2) Applications: Provide at Forestry Lab Counters at Coaledo Hall; or as indicated in Drawings
- 2. Stainless steel countertop, integral sink and backsplash, SS-1
  - a. Approved Manufacturers:
    - 1) Air Master Systems, Corp; [www.airmastersystems.com](http://www.airmastersystems.com).
    - 2) Ecolab; [www.bedcolab.com](http://www.bedcolab.com).
    - 3) CiF Lab Solutions LP; [www.cifsolutions.com](http://www.cifsolutions.com).
    - 4) ICIsScientific; [www.iciscientific.com](http://www.iciscientific.com).
    - 5) Kewaunee International Group; [www.kewaunee.com](http://www.kewaunee.com).
    - 6) Mott Manufacturing Ltd. & Mott Manufacturing LLC; [www.mott.ca](http://www.mott.ca).
  - b. Countertops: Fabricate from 14-gauge, Type 304 stainless-steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide marine edge at front and end overhang of 1 inch over the base cabinets, and integral sink as indicated in Drawings.
  - c. Finish: No. 04.
  - d. Joints: Fabricate countertops without field-made joints; weld shop-made joints.
  - e. Sound deaden the countertop and sink undersurfaces with heavy-build mastic coating.
  - f. Extend the top down to provide a 1-1/2-inch-thick edge with a 1/2-inch return flange, or as indicated.
  - g. Form the backsplash coved to and integral with top surface, with a 1/2-inch thick top and side edges and 1/2-inch return flange, or as indicated.
  - h. Application: Provide at Lab Prep areas Sumner and Coaledo Hall; as indicated in Drawings.

## 2.5 LABORATORY WORK SURFACES

- A. Epoxy Resin:

1. Manufacturers: Products complying with this specification may be provided by the following manufacturers.
  - a. American Epoxy Scientific, 500 East 16<sup>th</sup> Street, Mountain Home, AR 72653 Tel: 870-425-7777.
  - b. Durcon Laboratory Tops, Inc., 206 Allison Drive, Taylor, TX 76574 Tel: 512 595-8000.
  - c. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.
  - d. Approved substitution.
2. Thickness:
  - a. Typical work surface: 1 inch (25 mm).
  - b. Fume hood work surfaces: Tops shall be 1¼ (32 mm) inches thick at outer edge, indented minimum ¼ inch (6 mm) to provide a raised rim around all exposed edges 1 inch (25 mm) wide, minimum, or as to allow for the fume hood sash. The front top edge of the raised rim and exposed vertical corners of the top shall be rounded or chamfered to a 1/8 inch (3 mm) radius. The juncture between the raised rim and the top surface shall be coved or chamfered to a ¼ inch (6 mm) radius.
  - c. Curbs and Splashes: ¾ inch (19 mm).
3. Color: "Grey."
  - a. Color sample to be approved by Architect before work is put in hand.
4. Description:
  - a. Monolithic filled epoxy resin work surface consisting of a polymerized cast resin material oven-cured in molds.
  - b. Drip Grooves: Provide under all work surface exposed edges, unless noted otherwise on the Laboratory Furnishing Drawings. Drip grooves shall be ½ inch (13 mm) from the front edge where the top overhangs 1 inch (25 mm) and ¼ inch (6 mm) from the edge where the edge overhangs ½ inch (13 mm).
  - c. Edge profile: For all exposed upper edges and corners:
    - 1) Bevel eased: 1/8 inch (3 mm) machined bevel with blended radius corners.
  - d. Sink Mounting:
    - 1) Drop-in Sink Cutouts: Cutouts shall be profiled to provide support for the sink, and to ensure that the rim of the installed sink is 1/8 inch (3 mm) below the surrounding work surface level or bottom of drain grooves, if present. The top edge of the cutout shall have 1/8 inch (3 mm) bevel. Ensure that there shall be no gaps between the installed sink rim and work surface.
  - e. Curbs and Splashes:
    - 1) Height: 4 inches (100 mm), unless noted otherwise on Laboratory Furnishing Drawings.
    - 2) Bonded to the surface of the top to form a square joint.
  - f. Provide all holes and cutouts as required for built-in equipment and mechanical and electrical service fixtures. Verify size of opening with actual size of equipment to be used prior to making openings. Form inside corners to a radius of not less than 1/8 inch (3 mm). After sawing, rout and file cutouts to ensure smooth, crack-free edges. Seal exposed edges after cutting with a waterproofing material recommended by the manufacturer.

- g. Provide full-length, one-piece tops and backsplashes wherever possible, and keep field joints to an absolute minimum.
5. Physical Properties:
- a. Chemical resistance:
- 1) Organic solvents: A cotton ball, saturated with the test chemical, is placed in a one ounce bottle with a reservoir of liquid above the ball. The container is inverted on the test material surface for a period of 24 hours. Test temperature: 23°C ±2°C.
  - 2) Other test chemicals: Five drops (1/4 cc) of the test chemical are placed on the test material surface. The chemical is covered with a 1 inch diameter watch glass for a period of 24 hours. Test temperature: 23°C ±2°C.
  - 3) Evaluation: After 24 hours exposure, exposed areas are washed with water, then a detergent solution, finally with naphtha, then rinsed with distilled water, dried with a cloth, and rated as follows:
 

	0	1	2	3	4
No effect	No detectable change in the material surface.	Excellent	Slight detectable change in color or gloss but no change in function or life of the surface.	Good	A clearly discernable change in color or gloss but no significant impairment of surface life or function.
		Fair	Objectionable change in appearance due to discoloration or etch, possibly resulting in deterioration of function over an extended period of time.		
		Failure	Pitting, cratering, or erosion of the surface. Obvious and significant deterioration.		
  - 4) Test results:

Test chemical	Concentration				
		Black	Dark gray	Light gray	Beige
Chromic acid	40%	3	2	2	2
Hydrochloric acid	10%	0	0	0	0
Hydrochloric acid (conc.)	37%	0	0	0	0
Nitric acid	40%	0	0	0	0
Nitric acid (conc.)	70%	0	0	0	0
Sulfuric acid	60%	0	0	0	0
Sulfuric acid (conc.)	96%	4	4	4	4
Acetic acid	5%	0	0	0	0
Acetic acid (glacial)		0	0	0	0
Citric acid	1%	0	0	0	0
Oleic acid		0	0	0	0
Phenol solution	5%	0	0	0	0
Ammonium hydroxide	10%	0	0	0	0
Sodium carbonate sol.	20%	0	0	0	0
Sodium hydroxide sol.	60%	0	0	0	0
Sodium hypochlorite sol.	4%	0	0	0	0
Acetone		1	1	1	1

Test chemical	Concentration	Black	Dark gray	Light gray	Beige
Benzene	95%	1	1	1	1
Carbon tetrachloride		1	1	0	0
Diethyl ether		0	0	1	1
Dimethyl formamide		0	0	0	0
Ethyl acetate		0	1	1	0
Ethyl alcohol		0	0	0	0
Ethylene dichloride		0	0	0	0
Heptane		0	0	1	0
Isooctane		0	0	0	0
Kerosene		0	0	0	0
Methyl alcohol		0	0	0	0
Toluene		0	0	0	0
Aniline		0	0	0	0
Mineral oil		0	0	0	0
Olive oil		0	0	0	0
Soap solution	1%	0	0	0	0
Transformer oil		0	0	0	0
Turpentine		0	0	0	0

b. Heat resistance:

- 1) High temperature test: A porcelain crucible is heated to a dull red color, placed on the test material, and allowed to cool to ambient temperature. Result: No observable surface deformation.
- 2) Flame test: A 3/8 inch (10 mm) Bunsen burner is adjusted to a quiet flame with a 1½ inch (38 mm) inner cone, overturned on the test material, and allowed to stay for 5 minutes. Result: no observable surface deformation.

c. Physical properties:

Compressive strength	ASTM D695	31,400 psi (216 MPa)
Tensile strength	ASTM D638	8,000 psi (55 MPa)
Flexural strength	ASTM D790	11,700 psi (81 MPa)
Rockwell hardness "M"	ASTM D785	105-110
Specific density	ASTM D792	122.4 lb/ft³ (1960 kg/m³)
Water absorption	ASTM D570	0.01%
Fire Resistance	ASTM D635	ATB (sec)=0
Heat deflection @ 264 psi (1.82 MPa)	ASTM D648	205°F (172°C)

B. High-Pressure Decorative (Plastic) Laminate Tops:

1. Facing Material:

- a. Manufacturers: Products complying with this specification may be provided by the following manufacturers.
  - 1) Wilsonart International, 2400 Wilson Place, P. O. Box 6110, Temple, TX 76503 Tel: 800 433-3222.



- 2) Pionite Decorative Surfaces, One Pionite Road, Auburn, ME 04211 Tel: 800 746-6483.
  - 3) Formica Corporation, 10155 Reading Road, Cincinnati, OH 45241 Tel: 800 367-6422.
  - 4) Approved substitution.
2. Substrate Thickness:
  - a. Typical work surface: 1 inch (25 mm).
  - b. Curbs and Splashes:  $\frac{3}{4}$  inch (19 mm).
3. Color: To be selected by Architect from manufacturer's full color line.
4. Description:
  - a. High-pressure decorative laminate meeting or exceeding the requirements of NEMA LD3 Type HGS, consisting of a resin formulation applied over the decorative surface paper. The decorative paper shall be treated with melamine resin, and the core shall consist of kraft papers impregnated with phenolic resin. Sheets shall be bonded under high temperature and pressure.
  - b. Finish: Fine beaded "crystal" texture to minimize smudges and finger marks, and to provide optimum scratch resistance.
  - c. Core material: Hardwood veneer core plywood.
    - 1) Description: A one step calibrated core +/- .5mm (to avoid voids) with type 1 waterproof nauf glue. Grade 2 face, and back of mill choice plywood veneer.
    - 2) Thickness/Plies:
      - a)  $\frac{3}{4}$  inch (19 mm): minimum 7-ply.
      - b) 1 inch (25 mm): minimum 9-ply.
    - 3) Physical Properties:
      - a) Average modulus of rupture: 7346 psi (50.65 N/mm<sup>2</sup>).
      - b) Face Screw Holding Strength: 355 lbf (1579 N).
  - d. Backing sheets: High-pressure phenolic meeting or exceeding NEMA Standard LD3-2005 Grade BKL.
  - e. Plastic laminate adhesive: High-pressure decorative laminate shall be bonded to core with thermosetting resorcinol or phenol-resorcinol adhesive, or as recommended by the manufacturer for the application, at temperature above 65 degrees Fahrenheit (18°C) at a pressure no less than 15 pounds per square inch (103 kPa). Laminate core is not to exceed 10% moisture content and is to be laminated and cured in a controlled environment between 45% and 60% RH.
  - f. Edging: Tops shall be edged with 3 mm PVC edge banding set in hot melt adhesive. Adhesive shall have a minimum softening point of 150 degrees Fahrenheit (65°C). Apply primer to substrate when recommended by adhesive manufacturer.
  - g. Provide all holes and cutouts as required for built-in equipment and mechanical and electrical service fixtures. Verify size of opening with actual size of equipment to be used prior to making openings. Form inside corners to a radius of not less than 1/8 inch (3 mm). After sawing, rout and file cutouts to ensure smooth, crack-free edges. Seal exposed edges after cutting with a waterproofing material recommended by the manufacturer.

- h. Provide full-length, one-piece tops and backsplashes wherever possible, and keep field joints to an absolute minimum.
- i. Sinks:
  - 1) Cutouts for top-mounted sinks shall be routed and sanded to form smooth edged openings.
  - 2) Seal exposed edges after cutting with a waterproofing material recommended by the manufacturer.
- j. Curbs and Splashes:
  - 1) Height: 4 inches (100 mm), unless noted otherwise on Laboratory Furnishing Drawings.
  - 2) Fabricate similar to top with PVC edge band along exposed ends.
  - 3) Splash shall be set in a thin bead of silicone sealant to prevent moisture migration through the joint.
- k. Physical Properties:
  - 1) Reference Standard: Plastic laminates shall meet or exceed ANSI/NEMA Specification LD3-2005 as specified herein.
  - 2) Minimum Thickness: 0.048 inches  $\pm$  0.005 inches (1.22 mm  $\pm$  0.13 mm).
  - 3) Cleanability: 10 cycles (NEMA LD3 test method 3.4).
  - 4) Boiling Water Resistance: No effect (NEMA LD3 test method 3.5).
  - 5) High Temperature Resistance: Slight effect (NEMA LD3 test method 3.6).
  - 6) Ball Impact Resistance: 65 inches (1651 mm) (NEMA LD3 test method 3.8).
  - 7) Radiant Heat Resistance: 160 sec (NEMA LD3 test method 3.10).
  - 8) Dimensional change:
  - 9) Machine direction: 0.30% (NEMA LD3 test method 3.11).
  - 10) Cross direction: 0.70% (NEMA LD3 test method 3.11).
  - 11) Wear resistance: 700 cycles, min. (NEMA LD3 test method 3.13).
  - 12) Appearance: No ABC defects.
  - 13) Light Resistance: Slight effect.
  - 14) Stain Resistance Performance Test Results: The surface shall show essentially no effect on Black (Lab grade) plastic laminate when left in contact for 16 hours either when reagents were kept covered or allowed to evaporate.

0	No effect	No detectable change in the material surface.
1	Excellent	All stain reagents removed with no impairment to surface appearance. Any change in gloss due to the cleaning procedure is permitted.
2	Good	Moderate Effect: A difficult to perceive stain visible from all angles and directions. Any change in gloss due to the cleaning procedure is permitted.
3	Fair	Severe effect: Any easy to perceive stain or disturbed surface visible from all angles and directions.

4	Failure	Pitting, cratering, or erosion of the surface. Obvious and significant deterioration.
Stain		Rating
	Distilled water	1
	50%/50% Ethyl alcohol	1
	Acetone	1
	Household ammonia	1
	10% Citric acid	1
	Vegetable oil	1
	Fresh coffee	1
	Fresh tea	1
	Catsup	1
	Yellow mustard	1
	10% Povidone iodine	2
	Black permanent marker	2
	No. 2 pencil	2
	Wax crayon	2
	Black paste shoe polish	2

C. Acrylic Solid Surface

1. Manufacturers: Products complying with this specification may be provided by the following manufacturers.
  - a. LG Hausys of America, Inc., 900 Circle 75 Parkway, Suite 1500 Atlanta, GA 30339  
Tel: 678-486-8250.
  - b. Approved substitution.
2. Basis of Design: Hi-Macs.
3. Thickness:
  - a. Typical work surface:  $\frac{3}{4}$  inch (19 mm).
  - b. Curbs and Splashes:  $\frac{3}{4}$  inch (19 mm).
4. Color: As selected by Architect.
5. Description:
  - a. Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, inert filler, and pigment. Cast flat, with a uniform non-glare matte finish.
  - b. Fabricate joints between components using manufacturer's standard joint adhesive according to manufacturer's recommendations. Ensure joints are inconspicuous in appearance and without voids.
  - c. Provide structural reinforcement as recommended by manufacturer.
  - d. Drip Grooves: Provide under all work surface exposed edges, unless noted otherwise on the Laboratory Furnishing Drawings. Drip grooves shall be  $\frac{1}{2}$  inch (13 mm) from the front edge where the top overhangs 1 inch (25 mm) and  $\frac{1}{4}$  inch (6 mm) from the edge where the edge overhangs  $\frac{1}{2}$  inch (13 mm).
  - e. Edge profile: All exposed upper edges and corners shall have  $\frac{1}{8}$  inch (3 mm) bevel.
  - f. Provide all holes and cutouts as required for sinks and plumbing service fixtures. Verify size of opening with actual size of equipment to be used prior to making openings. Form inside corners to a radius of not less than  $\frac{1}{8}$  inch (3 mm). After

sawing, rout and file cutouts to ensure smooth, crack free edges. Seal exposed edges after cutting as recommended by the manufacturer.

- g. Provide full-length, one-piece tops and backsplashes wherever possible, and keep field joints to an absolute minimum.
- h. Sink Mounting:
  - 1) Adhere topmount (drop-in) sinks/bowls to countertops using manufacturer recommended adhesives and color-coordinated silicone sealant.
- i. Curbs and Splashes:
  - 1) Height: 4 inches (100 mm), unless noted otherwise on Laboratory Furnishing Drawings.
  - 2) Bonded to the surface of the top to form a square joint.
- j. Joint Adhesive: Manufacturer's standard, low VOC emitting joint adhesive to create inconspicuous, non-porous joints.
- k. Sealant: Mildew-resistant, color compatible silicone sealant as recommended by the manufacturer

## 2.6 SHELVING ASSEMBLIES

### A. High-Pressure Decorative (Plastic) Laminate Shelving:

- 1. Manufacturers/Facing material: Products complying with this specification may be provided by the following manufacturers.
  - a. Nevamar Decorative Surfaces, One Nevamar Place, Hampton, SC 29924 Tel: 800 638-4380.
  - b. Pionite Decorative Surfaces, One Pionite Road, P.O. Box 1014, Auburn, ME 04211 Tel: 800 746-6483.
  - c. Wilsonart International, 2400 Wilson Place, P. O. Box 6110, Temple, TX 76503 Tel: 800 433-3222.
  - d. Approved substitution (no known equal).
- 2. Approved Products:
  - a. Nevamar ChemArmor.
  - b. Pionite ChemGuard.
  - c. Wilsonart ChemSurf
- 3. Color: To be selected by Architect from manufacturer's full color line.
- 4. Description:
  - a. High-pressure decorative laminate, meeting or exceeding NEMA Standard LD3 2005 Grade HGP, HGL, or HGS requirements, consisting of a resin formulation applied over the decorative surface paper to achieve chemical resistance. The decorative paper shall be treated with melamine resin, and the core shall consist of kraft papers impregnated with phenolic resin. Sheets shall be bonded under high temperature and pressure. Product shall be developed for casework, work surface, and shelving surfaces in laboratories.
  - b. Laminate shall be applied to top and bottom surfaces.
  - c. Finish: Fine pebble-grained "crystal" texture or matte texture with slight sheen to minimize smudges and finger marks, and to provide optimum scratch resistance.

- 1) Gloss: 15-16 +/- 3 gloss units.
- d. Physical Properties:
- 1) Reference Standard: Plastic laminates shall meet or exceed ANSI/NEMA Specification LD3-2005 as specified herein.
  - 2) Minimum Thickness: 0.038 inches  $\pm$  0.005 inches (0.97 mm  $\pm$  0.13 mm).
  - 3) Cleanability: 10 cycles (NEMA LD3 test method 3.4).
  - 4) Boiling Water Resistance: No effect (NEMA LD3 test method 3.5).
  - 5) High Temperature Resistance: Slight effect (NEMA LD3 test method 3.6).
  - 6) Scratch Resistance: 4.5 Newtons (NEMA LD3 test method 3.7).
  - 7) Ball Impact Resistance: 60 inches (1524 mm) (NEMA LD3 test method 3.8).
  - 8) Radiant Heat Resistance: 200 sec (NEMA LD3 test method 3.10).
  - 9) Dimensional change:
  - 10) Machine direction: 0.50% (NEMA LD3 test method 3.11).
  - 11) Cross direction: 0.80% (NEMA LD3 test method 3.11).
  - 12) Wear resistance: 1,500 cycles, min. (black); 700 cycles, min. (other colors) (NEMA LD3 test method 3.13).
  - 13) Blister Resistance: 70 sec (NEMA LD3 test method 3.15).
  - 14) Stain Resistance Performance Test Results: The surface shall show essentially no effect on Black (Lab grade) plastic laminate when left in contact for 16 hours either when reagents were kept covered or allowed to evaporate.

0	No effect	No detectable change in the material surface.
1	Excellent	Slight detectable change in color or gloss but no change in function or life of the surface.
2	Good	A clearly discernable change in color or gloss but no significant impairment of surface life or function.
3	Fair	Objectionable change in appearance due to discoloration or etch, possibly resulting in deterioration of function over an extended period of time.
4	Failure	Pitting, cratering, or erosion of the surface. Obvious and significant deterioration.

#### Acids

	Concentration	Rating
Acetic acid	All	0
Aqua regia		0
Chromic trioxide (Chromic acid cleaning solution)		1
Glacial acetic acid	99%	0

Acids		
	Concentration	Rating
Hydrochloric acid	All	0
Hydrofluoric acid	48%	0
Formic acid	All	0
Nitric acid	All	3
Sulfuric acid	All	0
Perchloric acid (concentrated)		0
Phosphoric acid	All	0
Picric acid	1.2%	0
Tannic acid (saturated)		0
Uric acid (saturated)		0
Alkalis		
Ammonium hydroxide	All	0
Sodium hydroxide	All	3
Sodium sulfide	15%	0
Solvents		
Acetone		0
Amyl acetate		0
Amyl alcohol		0
Butyl alcohol		0
Carbon disulfide		0
Carbon tetrachloride		0
Chlorobenzene		0
Chloroform		0
Cresol		0
Dimethylformamide		0
Dioxane		0
EDTA		0
Ethyl acetate		0
Ethyl alcohol		0
Formaldehyde		0
Methanol		0
Methyl ethyl ketone		0
Methylene chloride		0
n-Hexane		0
Naphthalene		0
Phenol		0
Tetrahydrofuran		0
Toluene		0
Trichlorethane		0
Xylene		0
General Reagents		
Alconox (lab detergent)		0
Aluminon		0
Ammonium phosphate		0

<b>General Reagents</b>		
Aromatic ammonia		0
Benedicts solution		0
Calcium hypochlorite (concentrated)		0
Camphorated parachlorophenol		1
Cellosolve		0
Copper sulfate		0
Ethylene glycol		0
Eucalyptol		0
Formalin		0
Gasoline		0
Hydrogen peroxide	3%	0
Iodine		0
Karl Fisher Reagent		0
Kerosene		0
Lactated ringers		0
Lysol		0
Methyl methacrylate		0
Mineral Oil		0
Monse's solution (Ferric subsulfate)		0
Naphtha		0
Petroleum jelly		0
Phosphate buffered saline (PBS)		0
Pine oil		0
Potassium permanganate		0
Povidone iodine		0
Procaine		0
Quaternary ammonia compounds		0
Silver nitrate		0
Sodium azide		0
Sodium chromate		0
Sodium hypochlorite	5%	0
Sodium thiocyanate		0
Sucrose	50%	0
Thymol & Alcohol		0
Tincture of Iodine		0
Tincture of Mercurochrome		0
Tincture of Merthiolate		0
Trisodium phosphate	30%	0
Urea		0
Vegetable oils		0
Water		0
Zephiran chloride		0
Zinc chloride		0
Zinc oxide ointment		0
<b>Stains and Indicators</b>		
Ag Eosin Bluish 5% in Alcohol		0
Bromothymol Blue		0
Cresol Red		0
Crystal Violet		0
Gentian Violet	1%	0
Gram Stains		0
Malachite Green		0
Methyl Orange		0

Stains and Indicators	
Methyl Red	0
Methylene Blue	0
Nigrosine	0
Safranin O	0
Sudan III	0
Thymol Blue	0
Wright's Blood Stain	0

5. Plastic laminate adhesive: High-pressure decorative laminate shall be bonded to core with thermosetting resorcinol or phenol-resorcinol adhesive, or as recommended by the manufacturer for the application, at temperature above 65°F (18.3°C) at a pressure no less than 15 pounds per square inch. Laminate core is not to exceed 10% moisture content and is to be laminated and cured in a controlled environment between 45% and 60% RH.
  6. Core material: Hardwood Veneer Plywood.
    - a. Description: A one step calibrated core +/- .5mm (to avoid voids) with type 1 waterproof nauf glue. Grade 2 face, and back of mill choice plywood veneer.
    - b. Thickness/Plies:
      - 1) 1 inch (25 mm): minimum 9-ply.
    - c. Physical Properties:
      - 1) Average modulus of rupture: 7346 psi (50.65 N/mm<sup>2</sup>).
      - 2) Face Screw Holding Strength: 355 lbf (1579 N).
  7. Edging:
    - a. Unless otherwise indicated, all edges shall be edgebanded with 3 mm PVC edge banding set in hot melt adhesive. Adhesive shall have a minimum softening point of 150°F (65.6°C). Apply primer to substrate when recommended by adhesive manufacturer. Contact cement is not acceptable. Color of edgebanding to be selected by the Architect.
- B. Safety Edges:
1. Types:
    - a. Retainer Rail: ¼ inch (6 mm) diameter stainless steel retainer rail, as indicated on the drawings.
  2. Refer to the description of each system below for locations of each type.
- C. Reagent Shelves on adjustable shelf standards with a steel tube support system.
1. Shelving: High-Pressure Decorative Laminate shelving as specified above.
  2. Steel Frame Support System: Provide cold rolled steel tube vertical and horizontal support members with radiused edges. All members shall be welded together. Grind all welds smooth and polish to produce clean smooth appearance with no visual evidence of welds after paint is applied. All vertical members shall be one piece continuous from floor to underside of structure above or to top horizontal member as indicated on the drawings. Horizontal top and intermediate members shall be one piece between vertical members. Provide welded caps at all open ends of tube sections. Secure vertical members to floor slab, underside of benchtop, if indicated on the drawings, and to underside of structure above.
    - a. Tube steel dimensions:
      - 1) 2 inches x 2 inches, 12 gauge (50 x 50 x 2.8 mm).



3. Shelf standards:
    - a. Steel tubes shall be punched to receive adjustable shelf brackets. Pattern shall match Knape & Vogt 85 ANO series uprights, length in accordance with drawings.
  4. Shelf Brackets: 16 gauge (1.6 mm thick) bookend type, as detailed on drawings.
  5. Safety edging:
    - a. Front Edge:
      - 1) Retainer rail.
    - b. Rear edge:
      - 1) Retainer rail.
  6. Load capacity: System shall support a minimum of 35 pounds per square foot applied at all shelves simultaneously. Maximum deflection shall be 0.35 inches (9mm) under load.
  7. Finish: Factory-finish steel tube support system, shelf standards, and brackets with epoxy powder coating. Color to be selected by the Architect.
- D. Adjustable Wall Shelves:
1. Shelving: High-Pressure Decorative Laminate shelving as specified above.
  2. Double Slot Shelf Standards:
    - a. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.
      - 1) Knape & Vogt Manufacturing Company, 2700 Oak Industrial Drive NE, Grand Rapids, MI 49505 Tel: 616 459-3311.
      - 2) Approved substitution.
    - b. Basis of Design: Knape & Vogt 85 ANO series uprights, or equal. Length as indicated on the drawings.
  3. Shelf Brackets: 16 gauge (1.6 mm) bookend type, as detailed on drawings. Note that in some locations the baskets are to be inverted and located beneath the shelves as shown on the drawings.
  4. Safety edging:
    - a. Front Edge:
      - 1) Retainer rail.
  5. Load capacity: System shall support a minimum of 35 pounds per square foot applied at all shelves simultaneously. Maximum deflection shall be 0.35 inches (9mm) under load.
  6. Finish: Factory finish standards and brackets with epoxy powder coating. Color to be selected by the Architect.
- 2.7 BENCHTOP SLEEVE/GROMMENT (STAINLESS STEEL)
- A. Provide wire or cable access through ports of Type 304 stainless steel with No. 4 finish at bench tops as located and detailed on the Laboratory Furnishings drawings.
- 2.8 PLASTIC GROMMETS AND OTHER ACCESSORIES
- A. Round Grommets:
    1. Size: 2 3/8 inch (60 mm) O.D.

2. Material: Plastic
3. Accessories: Removable slotted plastic cover
4. Color: To be selected by Architect.
5. Basis of Design Model: Doug Mockett & Co., Inc. Model No. TG-3.
6. Refer to plans for location.
7. Manufacturers: Products complying with this specification may be provided by the following manufacturers.
  - a. Doug Mockett & Company, Inc., Box 3333, Manhattan Beach, CA 90266 Tel: 800 523-1269.
  - b. Häfele America Inc., 3901 Cheyenne Dr., P. O. Box 4000, Archdale, NC 27263 Tel: 336 889-2322.
  - c. Approved equal.

B. Utility Management Hook

1. Type 303 stainless steel hook with polished finish.
2. Size: 4 23/32 inch tall, 2 43/64 inch wide.
3. Load capacity: 22 pounds.
4. Basis of Design Model: McMaster-Carr Model No. 19075A12.
5. Manufacturer: McMaster Carr, P.O. Box 54960, Los Angeles, CA 90054-0960 Tel: 562 692-5911, or approved equal.

C. Grilles

1. Air intake grilles: Perforated metal mesh in a metal frame.
2. Sizes: As shown on drawings.
3. Mesh Pattern: Mesh 1.
4. Color: Factory-applied light grey paint.
5. Basis of Design Model: Doug Mockett & Co., Inc. GT Series Grilles.
6. Manufacturer: Doug Mockett & Co., Inc. P.O. Box 3333, Manhattan Beach, CA 90266 Tel 800 523-1269 or approved equal.

2.9 FINISH FOR MISCELLANEOUS WOOD ITEMS

- A. Applicability: This section applies to wood fabrications, including, but not limited to, wood laboratory tables, wood-framed balance tables, wood-framed pegboards, and wood filler panels.

B. Finish:

1. Manufacturer may use either of the following finish systems:
  - a. Customized, high-solids, cross-linked, ultraviolet light (UV)-cured coating developed for durability, including abrasion, chemical, impact, and scratch resistance, for flat-line applications. Coatings shall have little or no VOCs. Chemical-resistant modified acrylic urethane finish with built-in UV blocker, or equal, applied over permanent wood stain.
2. Stain Color:
  - a. To be selected by Architect from manufacturer's full published color range.
3. Application:

- a. Finish application and sequence shall be as recommended and designed by the manufacturer for a high quality, laboratory-grade wood casework finish.
- b. Preparation: Sand exposed surfaces smooth, free from dirt and defects.
- c. Stain application: Apply stain of color selected to all exposed casework surfaces. Apply in a manner to achieve a match with the selected color sample upon completion of application of the finish.
- d. Finish application: Apply top finish to all stained surfaces. Finished surfaces shall be even, water-clear and bright. Cloudy or muddy finishes carrying tinting pigments will not be acceptable.
- e. Stain Color:
  - 1) To be selected by Architect from manufacturer's full published color range.

C. Wood Finish Chemical Resistance Performance Requirements:

1. Manufacturer shall submit wood finish chemical resistance performance test results. Testing to be performed by independent testing agency.
2. Procedure: Place panel on a flat surface, clean with soap and water and blot dry. Condition the panel for 48 hours at 73 +/- 3 degrees Fahrenheit (23° +/- 2°C) and 50 +/- 5% relative humidity or the currently accepted guideline set by ASTM. Test the panel for chemical resistance using forty-nine different chemical reagents by one of the following methods. For both methods, leave the reagents on the panel for a period of one hour. Wash off the panel with water, clean with detergent and naphtha, and rinse with deionized water. Dry with a towel and evaluate after 24-hours at 73° +/- 3°F (23° +/- 2°C) and 50 +/- 5% relative humidity, or the currently accepted guideline set by ASTM.
  - a. Method A: Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a one-ounce (29.574cc) bottle and inverting the bottle on the surface of the panel.
  - b. Method B: Test non-volatile chemicals by placing five drops of the reagent on the surface of the panel and covering with a 24mm watch glass, concave side down.
3. Rating System: Evaluations shall use the following rating system:

Level 0	No detectable change.
Level 1	Slight change in color or gloss.
Level 2	Slight surface etching or severe staining.
Level 3	Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.
4. Acceptance Level:
  - a. Individual test results for the specified 49 reagents shall be within the Range for that reagent as specified on the table below.
  - b. There shall be no more than four (4) Level 3 conditions.
5. Table of reagents:

Test No.	Chemical Reagent	Test Method	Range
1.	Acetate, Amyl	A	0-1
2.	Acetate, Ethyl	A	0-1
3.	Acetic Acid, 98%	B	0-1
4.	Acetone	A	0
5.	Acid Dichromate, 5%	B	0-1
6.	Alcohol, Butyl	A	0-1
7.	Alcohol, Ethyl	A	0
8.	Alcohol, Methyl	A	0-1

Test No.	Chemical Reagent	Test Method	Range
9.	Ammonium Hydroxide, 28%	B	0-2
10.	Benzene	A	0-1
11.	Carbon Tetrachloride	A	0-1
12.	Chloroform	A	0
13.	Chromic Acid, 60%	B	0-1
14.	Cresol	A	0-2
15.	Dichloroacetic Acid	A	0-3
16.	Dimethylformamide	A	0-2
17.	Dioxane	A	0-1
18.	Ethyl Ether	A	0-1
19.	Formaldehyde, 37%	A	0
20.	Formic Acid, 90%	B	0-1
21.	Furfural	A	0-1
22.	Gasoline	A	0
23.	Hydrofluoric Acid, 37%	B	0-2
24.	Hydrofluoric Acid, 48%	B	0-2
25.	Hydrogen Peroxide, 30%	B	0-1
26.	Iodine, Tincture of	B	0-2
27.	Methyl Ethyl Ketone	A	0
28.	Methylene Chloride	A	0-1
29.	Monochlorobenzene	A	0-1
30.	Naphthalene	A	0
31.	Nitric Acid, 20%	B	0
32.	Nitric Acid, 30%	B	0-2
33.	Nitric Acid, 70%	B	2-3
34.	Phenol, 90%	A	0-2
35.	Phosphoric Acid, 85%	B	0-1
36.	Silver Nitrate Saturated	B	0-1
37.	Sodium Hydroxide 10%	B	0-2
38.	Sodium Hydroxide 20%	B	0-2
39.	Sodium Hydroxide 40%	B	0-2
40.	Sodium Hydroxide Flake	B	0
41.	Sodium Sulfide Saturated	B	0
42.	Sulfuric Acid, 33%	B	0-1
43.	Sulfuric Acid, 77%	B	0-1
44.	Sulfuric Acid, 96%	B	1-3
45.	Sulfuric Acid 77% & Nitric Acid 70% equal parts	B	1-3
46.	Toluene	A	0
47.	Trichloroethylene	A	0
48.	Xylene	A	0
49.	Zinc Chloride, Saturated	B	0

## 2.10 METAL FABRICATIONS

- A. Applicability: This section applies to metal fabrications, including, but not limited to, pipe drop enclosures, shelving support systems, metal-framed laboratory tables, cylinder racks, and other miscellaneous brake-formed and shop fabricated components and trim.
- B. Manufacturers: Products complying with this specification may be provided by the following manufacturers, and/or other manufacturers that may be listed under individual products within this specification.
  1. Kumar Industries, 4775 Chino Avenue, Chino, CA 91710 Tel: 909 591-0722.
  2. Approved substitution.

C. Materials:

1. Steel: Cold-rolled furniture stock sheet steel, prime grade, roller leveled.
  - a. Steel shall be treated at the mill to be free of scale, ragged edges, deep scratches, or other injurious effects.
  - b. All gauges indicated are to be U.S. standard.

D. Finish Requirements:

1. Paint finish for steel laboratory products shall utilize a dry coating process with minimal waste generation. Liquid-applied coatings shall not be acceptable. Manufacturer shall supply documentation that waste generated during the painting process, is a solid, non-hazardous material.
  - a. Pretreatment: Finish process shall incorporate a phosphate conversion coating during the pretreatment/cleaning operation.
  - b. Operator Protection: The painting process shall be cleanly contained, have no solvent odor and be performed in an air-conditioned room.
  - c. VOC (Volatile Organic Compounds) emissions shall not exceed 0.29 pounds per gallon (35 g/L).
  - d. Offgasing: No further emissions or "Offgasing/Decomposition" vapors shall occur at room temperature from installed finished parts.
2. Preparation: After the units have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish to the metal and to aid in the prevention of corrosion. Physical and chemical cleaning of the metal shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a heated cleaner/phosphate solution and pretreated with iron phosphate spray followed by a neutral final seal prior to application of final finish. The strength of each solution shall be monitored by filtration to insure consistent quality. All treated parts shall be immediately dried in heated ovens and gradually cooled before application of the finish. Treated metal parts shall be clean and properly prepared to provide optimum adhesion of finish and resistance to corrosion.
3. Application: Electrostatically apply powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thicknesses:
  - a. All surfaces, exterior or interior, exposed to view, shall receive sufficient powder coat to achieve an average 1.5 mil (38  $\mu$ m) film thickness with a minimum 1.2 mil (30  $\mu$ m) film thickness and shall have smooth satin luster.
  - b. Backs of cabinets and other surfaces not exposed to view shall have sufficient powder coat to achieve an average 1.0 mil (25  $\mu$ m) film thickness.
4. All drawer bodies to be finished in matching color.
5. Concealed interior parts shall receive corrosion-resistant treatment.
6. Finish must be UV stable.
7. Color: As selected by the Architect.

E. Finish Performance Requirements:

1. Manufacturer shall submit metal finish performance testing results. Testing to be performed by independent testing agency.
2. Chemical Resistance:

- a. Test procedure: Place samples on a flat surface, clean with soap and water and blot dry. Condition the panel for 48 hours at 73 +/- 3 degrees Fahrenheit (23(+ 2(C) and 50+ 5% relative humidity, or the currently accepted guideline set by ASTM. Test the samples for chemical resistance using forty-nine different chemical reagents by one of the following methods. For both methods, leave the reagents on the sample for a period of one hour. Wash off the sample with water, clean with detergent and naptha, and rinse with deionized water. Dry with a towel and evaluate after 24 hours at 73 +/- 3 degrees Fahrenheit (23°± 2°C) and 50± 5% relative humidity, or the currently accepted guideline set by ASTM
- 1) Method A: Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a 1 ounce (29.574cc) bottle and inverting the bottle on the surface of the sample. The cotton ball shall remain in contact with the sample for the duration of the test.
  - 2) Method B: Test non-volatile chemicals by placing five drops of the reagent on the surface of the sample and covering with a 24mm watch glass, convex side down.
- b. Rating System: Evaluations shall use the following rating system:
- |         |   |
|---------|---|
| Level 0 | No detectable change.   |
| Level 1 | Slight change in color or gloss.  |
| Level 2 | Slight surface etching or severe staining.  |
| Level 3 | Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration. |
- c. Acceptance Level:
- 1) Individual test results for the specified 49 reagents shall be within the Range for that reagent as specified on the table below.
  - 2) There shall be no more than four (4) Level 3 conditions.
- d. Table of reagents:

Test No.	Chemical Reagent	Test Method	Range
1.	Acetate, Amyl	A	0-1
2.	Acetate, Ethyl	A	0-2
3.	Acetic Acid, 98%	B	0-3
4.	Acetone	A	0-1
5.	Acid Dichromate, 5%	B	0-1
6.	Alcohol, Butyl	A	0-1
7.	Alcohol, Ethyl	A	0-1
8.	Alcohol, Methyl	A	0-1
9.	Ammonium Hydroxide, 28%	B	0
10.	Benzene	A	0-2
11.	Carbon Tetrachloride	A	0-1
12.	Chloroform	A	0-2
13.	Chromic Acid, 60%	B	0-2
14.	Cresol	A	0-2
15.	Dichloroacetic Acid	A	0-3
16.	Dimethylformamide	A	0-2
17.	Dioxane	A	0-2
18.	Ethyl Ether	A	0-1
19.	Formaldehyde, 37%	A	0-1
20.	Formic Acid, 90%	B	0-3
21.	Furfural	A	0-3
22.	Gasoline	A	0
23.	Hydrofluoric Acid, 37%	B	0-2
24.	Hydrofluoric Acid, 48%	B	0-3

Test No.	Chemical Reagent	Test Method	Range
25.	Hydrogen Peroxide, 30%	B	0-1
26.	Iodine, Tincture of	B	0-2
27.	Methyl Ethyl Ketone	A	0-2
28.	Methylene Chloride	A	0-2
29.	Monochlorobenzene	A	0-2
30.	Naphthalene	A	0-1
31.	Nitric Acid, 20%	B	0-1
32.	Nitric Acid, 30%	B	0-1
33.	Nitric Acid, 70%	B	0-3
34.	Phenol, 90%	A	0-2
35.	Phosphoric Acid, 85%	B	0-1
36.	Silver Nitrate Saturated	B	0
37.	Sodium Hydroxide 10%	B	0
38.	Sodium Hydroxide 20%	B	0
39.	Sodium Hydroxide 40%	B	0-1
40.	Sodium Hydroxide Flake	B	0
41.	Sodium Sulfide Saturated	B	0
42.	Sulfuric Acid, 33%	B	0
43.	Sulfuric Acid, 77%	B	0
44.	Sulfuric Acid, 96%	B	2-3
45.	Sulfuric Acid 77% & Nitric Acid 70% equal parts	B	1-3
46.	Toluene	A	0-1
47.	Trichloroethylene	A	0-1
48.	Xylene	A	0-1
49.	Zinc Chloride, Saturated	B	0

3. Hot Water Test

- a. Test Procedure: 190 to 205 degrees Fahrenheit (88°C to 96°C) hot water shall be allowed to trickle (with a steady stream and at a rate of not less than 6 ounces (177.5 cc) per minute) on the finished surface, which shall be set at an angle of 45 degrees Fahrenheit for a period of 5 minutes.
- b. Acceptance Level: After cooling and wiping dry, the finish shall show no visible effect from the hot water.

4. Paint Adhesion on Steel Test

- a. Test Procedure: Test shall be based on ASTM D2197-86 "Standard Method of Test for Adhesion of Organic Coating." Two sets of eleven parallel lines 1/16 inch (1.587 mm) apart shall be cut with a razor blade to intersect at right angles thus forming a grid to 100 squares. The cuts shall be made just deep enough to go through the coating, but not into the substrate. Brush surface lightly with a soft brush for one minute. Examine under 100 fc (1076 lux) of illumination.
- b. Acceptance Level: Ninety or more of the squares shall show finish intact.

5. Impact Test

- a. Test Procedure: Drop a 1 pound (0.4536 kg) ball approximately 2 inches (50.8 mm) in diameter from a distance of 12 inches (305 mm), onto a flat horizontal surface, coated to manufacturer's standard manufacturing method.
- b. Acceptance Level: No visual evidence to the naked eye of cracks in the finish due to impact.

6. Paint Hardness on Steel Test

- a. Test Procedure: Paint film shall be tested with pencils of various hardnesses. Pencils shall have a wide, sharp edge. Pencils shall be pushed across surface in a chisel-like manner.
- b. Acceptance Level: Finish film shall not rupture from a sharpened 4H pencil.

## 2.11 STAINLESS STEEL FABRICATIONS

- A. Applicability: This section applies to stainless steel fabrications, including, but not limited to, canopy hoods, drying racks, sinks, and other miscellaneous brake-formed and shop fabricated stainless steel components and trim as shown on the drawings.
- B. Manufacturers:
  1. The Diamond Group, 895 Munch Street, Laval, Quebec H7S 1A9 Canada Tel: 450 668-0330.
  2. Inter Dyne Systems, Inc., 676 Ellis Road, Norton Shores, MI 49441 Tel: 231 799-8760.
  3. Kloppenberg & Co., 2627 West Oxford Avenue, Englewood, CO 80110 Tel: 303 761-1615.
  4. Approved substitution.
- C. Materials and Finishes:
  1. Unless otherwise noted stainless steel shall be Type 304 and shall be of gauge indicated on Laboratory Furnishing drawings or this specification.
  2. All fabrications shall have exposed surfaces ground and polished to a No. 4 satin finish.
  3. All stainless steel nuts, screws, bolts, and rivets, etc., shall be of the same type stainless as in the sheet material and shall have a tumbled finish closely resembling that of a No. 4 finish.
  4. All stainless steel welding material shall be of type similar to the sheet material or a richer quality. All welds shall be made without discoloration and shall be ground, polished, and passivated to blend harmoniously with a No. 4 satin finish. All joints in stainless steel tops and work surfaces shall be welded.
- D. Laboratory Sink (Drop In):
  1. Thickness: 18 gauge (1.3 mm thick), unless otherwise noted.
  2. Construction: Sink units shall be designed and fabricated with sufficient reinforcement to prevent oil canning. All sink joints shall be butt-welded, ground smooth by the heliarc welding process. Inside radii shall be 1 inch (25 mm). Bottoms shall be pitched to the drain indent. No soldering will be permitted in connection with sink construction. Sink bowl dimensions given are inside dimensions. Underside shall have a heavy mastic agent coating providing sound deadening.
- E. Canopy Hood: Provide stainless steel canopy with all hangers and miscellaneous hardware at locations and sizes as indicated on the Laboratory Furnishing drawings.
  1. Thickness: 18 gauge.
  2. Construction: Provide reinforcing necessary to prevent oil canning or deflection of panel between supports. All corners and joints shall be welded, ground smooth and free of all defects. Welded joints with visible burn marks will not be accepted.
  3. Accessories: Provide stainless steel hangers and miscellaneous support hardware as required for a complete installation.
  4. Provide exhaust duct transition piece for mechanical connection above the ceiling under Division 23. Refer to the Exhaust Schedule on the drawings for required exhaust flow rate and connection diameter.



2.12 SLOTTED CHANNEL FRAMING

- A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.
1. Unistrut, 35660 Clinton Street, Wayne, MI 48184 Tel: 800 521-7730.
  2. Power Engineering Co. (Powerstrut), 420 Boston Turnpike, Shrewsbury, MA Tel: 800 274-1303.
  3. Kumar Industries (Nu-Strut), 4881 Chino Ave., Chino, CA 91710 Tel: 909 591-0722.
  4. Cooper B-Line Inc. (B-Line), 509 West Monroe St., Highland, IL 62249 Tel: 618 654-2184.
  5. Approved substitution.
- B. Materials: Channel and framing members shall be fabricated from steel conforming to the following requirements:
1. Framing Members:
    - a. Concealed Framing Members and Fittings: ASTM A570 GR 33.
    - b. Exposed Framing Members and Fittings: ASTM A446 GR A with zinc coating conforming to ASTM A525.
    - c. Stainless Steel Framing Members and Fittings: ASTM A240 (Type 304), where indicated.
  2. Fittings:
    - a. Concealed Fittings: Fabricate from steel satisfying the requirements of ASTM A570 GR 33, and conform to the following ASTM specifications: A575, A576, A36, or A635. Nuts shall conform to ASTM A576 GR 1015 and screws shall conform to SAE J429 GR 2 and ASTM A307.
    - b. Exposed Fittings: Fabricate from steel satisfying the requirements of ASTM A570 GR 33, and conform to the following ASTM specifications: A575, A576, A36, or A635. Nuts shall conform to ASTM A576 GR 1015 and screws shall conform to SAE J429 GR 2 and ASTM A307. Exposed fittings shall receive zinc coating conforming to ASTM A525.
    - c. Stainless Steel Fittings and Hardware: Sintered Nuts shall be of ASTM B783 (Type 316N2-33) stainless steel and fittings shall be of ASTM A240 (Type 304) stainless steel. Stainless steel fittings and hardware shall be used with stainless steel framing members, or where indicated.
  3. Thickness: 12 gauge, unless noted otherwise.
  4. Size: 1 5/8 inch x 1 5/8 inch cross-section, unless noted otherwise.
- C. Components:
1. The following components shall be provided, unless otherwise noted:
    - a. Framing Channel: 1 5/8 inch x 1 5/8 inch x 12 gauge: Unistrut P1000, Powerstrut PS 200, Kumar Industries N-200, B-Line Systems, Inc. B22, or equal.
    - b. Suspended Framing Channel, 3 1/4 inch x 1 5/8 inch x 12 gauge: Unistrut P5000, Powerstrut PS 100, Kumar Industries N-150, B-Line Systems, Inc. B11, or equal.
    - c. 90° Angle Fitting: 4 1/8 inch x 3 1/2 inch x 1/4 inch with two holes, each leg: Unistrut P1325, Powerstrut PS 607, Kumar Industries N-1123, B-Line Systems, Inc. B104, or equal.

- d. 135° Angle Fitting: 3 inch x 2 5/16 inch x ¼ inch with one hole, each leg: Unistrut P1546, Powerstrut PS 633-45°, Kumar Industries N-1425, B-Line Systems, Inc. B154, or equal.
  - e. T-Shaped Flat Plate Fitting: 5 3/8 inch x 3½ inch x ¼ inch plate, T-shaped, with four holes: Unistrut P1031, Powerstrut PS 714, Kumar Industries N-1022, B-Line Systems, Inc. B133, or equal.
  - f. Wing Shape Fitting, 9 5/32 inch x 3 7/8 inch ten holes, two holes in each wing section and two holes in each of three channel section sides: Unistrut P2347, Powerstrut PS 913, B-Line Systems, Inc. B273.
  - g. Vertical Posts: 3¼ inch x 1 5/8 inch x 12 gauge, double channel section: Unistrut P1001, Powerstrut PS 200 2T3, Kumar Industries N-200-A, B-Line Systems, Inc. B22A, or equal.
  - h. Horizontal Support Members: 1 5/8 inch x 1 5/8 inch x 12 gauge framing channel with 13/32 inch x 3 inch slotted holes, 4 inches on center: Unistrut P1000 SL, Powerstrut P 200 S, Kumar Industries N-200-SL, B-Line Systems, Inc. B22S, or equal.
  - i. Slotted Hole Framing Channel, 1 5/8 inch x 1 5/8 inch x 12 gauge framing channel with 13/32 inch x 3 inch slotted holes, 4 inches on center: Unistrut P1000 SL, Powerstrut P 200 S, Kumar Industries N-200-SL, B-Line Systems, Inc. B22S.
  - j. Slotted Framing Channel for installation in Chemical Fume Hoods, 1 5/8 inch x 13/16 inch x 16 gauge Type 316 stainless steel framing channel: Unistrut P4000 SS, Powerstrut PS 560 SS, Kumar Industries, B-Line Systems, Inc.
    - 1) Attach channel to side of fume hood with 2 5/8 inch x 1 7/8 inch x 1/8 inch, 4 hole, stainless steel 90° fitting: Unistrut P6325 SS, Powerstrut, Kumar Industries, B-Line Systems, Inc.
  - k. Diagonal Brace Supports: Framing Channel, 1 5/8 inch x 1 5/8 inch x 12 gauge: Unistrut P1000, Powerstrut PS 200, Kumar Industries N-200, B-Line Systems, Inc. B22, or equal.
  - l. Closure Strip: 0.04 inches thick snap-in cover for framing channel: Unistrut P3184, Powerstrut PS 6152, Kumar Industries N-1920, B-Line Systems, Inc. B217-24, or equal. Provide closure strips over all exposed vertical post sections.
  - m. End Caps: 0.06 inches thick for framing channel: Unistrut P1280, Powerstrut PS 707, Kumar Industries N-2500, B-Line Systems, Inc. B205, or equal. Provide end caps for all exposed horizontal framing channels.
  - n. Ceiling Escutcheon: Provide 18 gauge steel, finished to match framing members, as indicated on the Laboratory Furnishing drawings, at ceiling penetrations.
  - o. Other components, hardware, and fasteners, as required for a complete assembly and as indicated on the drawings.
2. Service Struts and Ledging:
- a. 16 gauge, 13/16 inch x 1 5/8 inch cold-formed framing uprights: Unistrut P4000, Powerstrut PS 560, Kumar Industries N-400, B-Line Systems, Inc. B56, or equal. Uprights shall be provided at 48 inches, maximum, and fastened top and bottom by two adjustable U-shaped spreaders.
  - b. U-shaped spreaders: 12 gauge by 1½ inch (45 mm) wide by length required, galvanized steel.
  - c. Locations:

- 1) Provide to support tops at pipe service chase space, support drain troughs, under fume hood superstructures, and other abnormal loads.
- 2) Support struts with U-shaped spreaders shall be provided at 48 inches (1220 mm) on center below island and peninsula benches, as indicated on drawings. Support struts shall be provided along wall 48 inches (1220 mm) on center below island and peninsula benches. Struts will be used to support piped and electrical services installed under Divisions 22, 26, and 27. Provide all bolts, expansion sleeves, and fastening devices for a complete assembly. Pipe and conduit hangers shall be provided by Division 22, 26, and 27 installers.
3. Cylinder and Dewar Restraint:
  - a. Swivel Hanger: 1 3/4 inch long by 3/8 inch diameter link welded to threaded stud; provide two per cylinder: Unistrut M2350, Powerstrut PS205, Kumar N-2911, B-Line 446B.
4. Overhead Support Grid
  - a. Exposed horizontal support members for user attachment, 3 1/4 inch x 1 5/8 inch x 1/4 inch framing channel: Unistrut P5000, Powerstrut P 100, Kumar Industries N-150, B-Line Systems, Inc. B11.
5. Finish:
  - a. Provide finish coating for all cold-formed framing components, except for stainless steel components.
  - b. Concealed Framing Members and Fittings: Rust inhibiting acrylic enamel paint applied by electrostatic deposition, after cleaning and phosphating, and thoroughly baked. Finish shall withstand a minimum of 400 hours salt spray when tested in accordance with ASTM B117. Color: Green.
  - c. Exposed Framing Members and Fittings: Factory applied epoxy powder coat. Color: To be selected by the Architect.

## 2.13 SEALANT

- A. Manufacturers: Products complying with this specification may be provided by the following manufacturers.
  1. Dow Corning Corporation, P.O. Box 994, Midland, MI 48686 Tel: 989 496-7881.
  2. General Electric Company, 260 Hudson River Rd., Waterford, NY 12188 Tel: 800 255-8886.
  3. C.R. Laurence Company, Inc., 600 Wharton Drive, Atlanta, GA 30336 Tel: 404 696-3445
  4. Approved substitution.
- B. Basis of Design: Dow Corning 732 Multi-Purpose Sealant, GE Silicones RTV 100 Series, C.R. Laurence CRL 33S Silicone, or equal.
- C. Characteristics:
  1. Type: One-part silicone rubber, MIL-A-46106.
  2. Physical form: Non-slumping paste.
  3. Cure: Cures at room temperature on exposure to water vapor in the air.
  4. Authorizations:
    - a. FDA Regulation No. 21 CFR 177.2600.

- b. USDA Rating P1.
  - c. NSF Rating C2.
  - d. UL 150 C Rating, File No. E40195 (N).
- 5. Properties:
  - a. Tack Free Time, ASTM C-679: 45 minutes, maximum.
  - b. Durometer, Shore A Hardness, ASTM D-2240: 20, minimum.
  - c. Tensile Strength, ASTM D-412: 220 pounds per square inch, minimum.
  - d. Elongation, ASTM D-412: 350 percent, minimum.
  - e. UV Resistance, ASTM C-793: Excellent.

### PART 3 - EXECUTION

#### 3.1 SITE CONDITIONS

- A. Inspection:
  - 1. Prior to installation of the work of this Section, carefully inspect the installed work specified in other Sections and verify that all such work is complete to the point where this installation may properly commence.
  - 2. Verify that all work may be installed in complete accordance with the original design, reviewed submittals, and the manufacturer's recommendations.
  - 3. Where floor conditions require shimming or leveling of more than  $\frac{3}{4}$  inch at any point, do not install casework in those locations. Notify the contractor and design team that remedial measures will be required to bring the floors closer to a level situation.
- B. Discrepancy: In the event of discrepancy, immediately notify the Architect.

#### 3.2 INSTALLATION

- A. Coordinate work with any Owner furnished and/or installed components indicated on drawings.
- B. General: Assemble units into one integral unit with joints flush, tight, and uniform. Align similar adjoining units to a tolerance of 1/16 inch (1.5 mm).
- C. Cabinets:
  - 1. Install cabinets to create a plumb, level, true and straight installation.
  - 2. Installation of metal and stainless steel casework fixed cabinets shall utilize the internal leveling devices. Do not use shims.
  - 3. Installation of wood casework shall be performed using shims. Shimming shall be minimized as much as possible, yet be sufficient to achieve a level and plumb condition.
  - 4. Installation shall maintain the required height of countertops, but in all cases must stay within the range required by the ADA regulations.
  - 5. Securely fasten wall units to solid supporting material, not plaster, lath, or wallboard. Anchor, adjust, and align wall cabinets as specified for base cabinets. Verify that all required backing and reinforcement necessary to support wall-mounted units is in place, secure, and accurately located.
- D. Installation materials:
  - 1. Installation of wood and plastic laminate may involve the use of shims, spacers, cleats, straps and other such items of either metal or wood composition.

2. Installation of metal casework shall use spacers, cleats, and straps of galvanized steel, epoxy-coated steel, or stainless steel. No wood materials of any sort shall be part of the permanent installation of metal casework.

E. Laboratory Tops:

1. Scribe tops as necessary for close and accurate fit. Joints between worksurfaces, backsplashes, and adjacent items, penetrations, or similar shall be hairline joints, with a maximum width of 1/16 inch.
2. Field Joints: Factory-prepared and identical to factory joints, locate only where indicated on approved Shop Drawings. Field processing of top and edge surfaces is not acceptable, except as described by manufacturer in approved Submittal Data. Provide full length, one-piece tops and backsplashes wherever possible, and keep field joints to an absolute minimum.
3. Abut top and edge surface in one true plane, with internal supports placed to prevent any deflection. Joints in top units shall be flush and the narrowest for the respective materials of construction. Cement top joints and laboratory sinks in accordance with the manufacturers' specifications.

F. Sealant:

1. Caulk edges of tops, backsplashes and side splashes to adjacent wall surface, tall cabinets, and fume hoods with silicone sealant.

3.3 DESTRUCTIVE TESTING

- A. The Owner, Architect, and/or Contractor may, at their own cost, elect to perform destructive testing on casework cabinet components (such as fronts, sides, etc.) to confirm compliance with the requirements of this specification. The casework manufacturer/installer should account for the de-installation, repair, and reinstallation, or replacement of one cabinet that may be selected for destructive testing.

3.4 CLEANING AND PROTECTION

- A. Repair or remove and replace defective work as approved by the Architect at no additional cost to the Owner.
- B. Clean finished units, touch up as required, and remove and refinish damaged or soiled areas.
- C. Cover tops with kraft paper, polyethylene sheeting, or all other means necessary after installation for protection against scratching, soiling, and deterioration during remainder of construction period. Remove protection prior to final cleaning.
- D. Clean counter tops with diluted dishwashing liquid and water leaving tops free of all grease and streaks. Use no wax or oils.

END OF SECTION

## SECTION 12 24 13 - ROLLER WINDOW SHADES

### 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. Manually operated roller shades with single rollers (RS-1).
  - 2. Accessories.
- B. Related Requirements:
  - 1. Division 08 "Openings" window sections for coordination with jamb-mounting.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
  - 1. Show mounting for each condition and roller shade type.
  - 2. Show drive-end location for manually operated shades.
- C. Samples: For each exposed product and for each color and texture specified, 10 inches long.
- D. Samples for Initial Selection: For each type and color of shadeband material.
  - 1. Include Samples of accessories involving color selection.
  - 2. Include finish samples of each color required prior to verification samples.
- E. Samples for Verification: For each type of roller shade.
  - 1. Shadeband Material: Not less than 3 inches square. Mark interior face of material if applicable.
- F. Product Schedule: For roller shades. Use same designations indicated on Drawings.
  - 1. Indicate fabric openness for each opening, coordinated with shop drawings.
  - 2. Indicate operation type, accessories, finishes, and roller drive-end location for manual shades.
- G. Qualification Data: For Installer.
- H. Product Certificates: For each type of shadeband material.
- I. Product Test Reports: For each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain roller shades from single source from single manufacturer.
- B. Basis-of-Design Manufacturer, Roller Shades: MechoShade Systems, LLC; [www.mechoshade.com](http://www.mechoshade.com).

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS, RS-1

- A. Basis-of-Design Product: Mecho/5 Manual Shade System by MechoShade Systems, LLC.
- B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
  - 1. Bead Chains: Stainless steel.
    - a. Loop Length: Full length of roller shade.
    - b. Limit Stops: Provide upper and lower ball stops.
    - c. Chain-Retainer Type: None required.
  - 2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.
    - a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criterion is more stringent.
- C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: As indicated on Drawings.
2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
  1. Application: Mounting shall occur at Sumner Hall adjacent to ACT ceiling with blocking as required as necessary.
- E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- F. Shadebands:
  1. Shadeband Material: Unless otherwise indicated on Drawings, provide the following:
    - a. At RS-1: Light-filtering fabric.
  2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
    - a. Type: Enclosed in sealed pocket of shadeband material.
    - b. Color and Finish: As selected by Architect from manufacturer's full range.
- G. Installation Accessories:
  1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
    - a. Shape: As indicated.
    - b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 3 inches.
    - c. Color: As selected by Architect from Manufacturer's standard range of colors.
    - d. Application: Provide front fascia at roller shades indicated to be surface mounted.
  2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
    - a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than 3 inches.
  3. Endcap Covers: To cover exposed endcaps.
  4. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
    - a. Coaledo Hall Style: No. 4123 or 4158; as selected by Architect.
      - 1) Application: Provide at openings at Coaledo Hall.
    - b. Sumner Hall Style: As selected by Architect.
      - 1) Application: Provide at openings at Coaledo Hall.
    - c. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than height indicated on Drawings.
    - d. Provide pocket with lip at lower edge to support acoustical ceiling panel.



5. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
  - a. Closure-Panel Width: As indicated on Drawings.
6. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
7. Installation Accessories Color and Finish: As selected from manufacturer's full range.

## 2.3 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
  1. Basis-of-Design Product: EcoVeil Screens, 1550 Series by MechoShades Systems, LLC.
  2. Application: Provide at openings as indicated.
  3. Openness Factor: 3 percent.
  4. Color: No. 1563 "Grey".
  5. Source: Roller shade manufacturer.
  6. Sustainability: PVC-free.
  7. Roll Width: As indicated in Drawings.
  8. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
    - a. Type: Enclosed in sealed pocket of shadeband material.

## 2.4 ROLLER SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
  1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:
  1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
  2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.
  3. Align batten and seams with vertical mullions, where occurs.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
  - 1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.
- B. Roller Shade Locations: As indicated in Drawings.
- C. Mounting: Between jambs; as indicated.
  - 1. At curtainwall framing, coordinate installation with curtainwall manufacturer and installer to not void warranty. Attach to curtainwall following curtainwall manufacturer's written instructions and approved methods. Do not install prior to approval from curtainwall installer.

#### 3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

#### 3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

#### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION

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SWOCC COALEDO AND SUMNER HALL  
EDA AWARD NO. 07-01-07738  
1988 NEWMARK AVENUE COOS BAY, OR 97420

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PROJECT MANUAL - VOLUME 2 OF 2  
SPECIFICATIONS DIVISIONS 21 - 33

PROJECT BIDDING  
MARCH 03, 2023





COALEDO HALL
SUMNER HALL

PROJECT MANUAL - VOLUME 2 OF 2

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

X	X	00 01 00	Specifications Table of Contents
X	X	00 11 13	Bid Solicitation
X	X	00 21 13	Instructions to Bidders
X	X	00 21 13B	AIA Document A701 Instructions to Bidders
X	X	00 22 10	Supplementary Instructions to Bidders
X	X	00 41 00	Bid Form
X	X	00 43 25	Substitution Request Form During Procurement
X	X	00 52 00	Agreement Form
X	X	00 52 00B	AIA Document A101 Standard Form of Agreement
X	X	00 72 00	Form of General Conditions
X	X	00 73 46B	AIA Document A201 General Conditions of the Contract
X	X	00 73 00	Supplementary Conditions
X	X	00 73 46	Davis-Bacon and Prevailing Wage Rates
X	X	00 73 46B	Wage Determination Online Homepage
X	X	00 73 46C	EDA Contracting Provisions
X	X	00 73 46D	Affirmative Action Requirements
X	X	00 73 46E	Lobby Restriction Form CD-512

DIVISION 01 - GENERAL REQUIREMENTS

X	X	01 10 00	Summary
X	X	01 25 00	Substitution Procedures
X	X	Form	Substitution Request Form, Bid Phase
X	X	Form	Substitution Request Form, CA Phase
X	X	01 26 00	Contract Modification Procedures
X	X	01 29 00	Payment Procedures
X	X	01 31 00	Project Management and Coordination
X	X	01 32 00	Construction Progress Documentation
X	X	01 33 00	Submittal Procedures
X	X	01 40 00	Quality Requirements
X	X	01 50 00	Temporary Facilities and Controls
X	X	01 57 22	Construction Indoor Air Quality
X	X	01 60 00	Product Requirements
X	X	01 60 10	Finish and Material Legend
X	X	01 61 16	Delegated Design Requirements
X	X	01 73 00	Execution
X	X	01 74 19	Construction Waste Management and Disposal
X	X	01 77 00	Closeout Procedures
X	X	01 78 23	Operation and Maintenance Data

COALEDO HALL	
SUMNER HALL	

X	X	01 78 39	Project Record Documents
X	X	01 79 00	Demonstration and Training

DIVISION 02 - EXISTING CONDITIONS

X	X	02 41 19	Selective Demolition
X	X	02 82 13	Asbestos Abatement Report

DIVISION 03 - CONCRETE

X		03 30 00	Cast-In-Place Concrete
X		03 54 13	Gypsum Cement Underlayment

DIVISION 04 - MASONRY

		NOT USED
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DIVISION 05 METAL

X	X	05 50 00	Metal Fabrications
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DIVISION 06 WOOD AND PLASTIC

X	X	06 10 10	Rough Carpentry
X	X	06 16 00	Sheathing
X	X	06 20 13	Exterior Finish Carpentry
X	X	06 20 23	Interior Finish Carpentry
X	X	06 41 10	Architectural Casework

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

X	X	07 01 50.19	Preparation for Re-Roofing
X	X	07 21 00	Thermal Insulation
X	X	07 25 00	Weather Barriers
X	X	07 46 46	Fiber-Cement Siding
X	X	07 54 23	Thermoplastic Polyolefin (TPO) Roofing
X	X	07 62 00	Sheet Metal Flashing and Trim
X	X	07 92 00	Joint Sealants

DIVISION 08 - OPENINGS

X		08 11 13	Hollow Metal Doors and Frames
X	X	08 14 16	Flush Wood Doors
X	X	08 31 13	Access Doors and Frames
X		08 41 13	Aluminum-Framed Entrances and Storefronts
X	X	08 71 00	Door Hardware
X	X	08 71 00.01	Door Hardware Index
X	X	08 80 00	Glazing
X	X	08 91 19	Fixed Louvers

COALEDO HALL
SUMNER HALL

DIVISION 09 - FINISHES

X	X	09 22 16	Non-Structural Metal Framing
	X	09 26 13	Gypsum Veneer Plastering
X	X	09 29 00	Gypsum Board
X	X	09 30 00	Tiling
X	X	09 51 23	Acoustic Panel Ceilings
X		09 54 26	Linear Wood Ceilings
X	X	09 65 00	Resilient Flooring
X	X	09 65 13	Resilient Base and Accessories
X	X	09 68 00	Carpeting
X		09 72 12	Fiberglass Reinforced Wall Covering
X	X	09 84 33	Sound-Absorbing Wall Panels
X	X	09 91 00	Painting
X	X	09 96 00	High-Performance Coatings

DIVISION 10 - SPECIALTIES

X	X	10 11 00	Visual Display Units
X	X	10 14 00	Panel Signage
X	X	10 21 13	Toilet Compartments
X	X	10 26 00	Wall Protection
X	X	10 28 00	Restroom and Custodial Accessories
X	X	10 44 00	Fire Protection Cabinets

DIVISION 11 - EQUIPMENT

X		11 31 10	Appliances
X	X	11 53 10	Laboratory Casework and Other Furnishings

DIVISION 12 - FURNISHINGS

X	X	12 24 13	Roller Window Shades
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DIVISION 13 - SPECIAL CONSTRUCTION

NOT USED

DIVISION 14 - CONVEYING EQUIPMENT

NOT USED

PROJECT MANUAL - VOLUME 2 OF 2

DIVISION 01 - GENERAL REQUIREMENTS

X	X	00 01 00	Specifications Table of Contents
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COALEDO HALL
SUMNER HALL

#### DIVISION 21 - FIRE SUPPRESSION

As determined by Plumbing Engineer

X	X
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#### DIVISION 22 - PLUMBING

X	X	22 00 00	General Requirements for Plumbing
X	X	22 05 16	Expansion Fittings and Loops for Plumbing Piping
X	X	22 05 17	Sleeves and Sleeve Seals for Plumbing Piping
X	X	22 05 19	Meters and Gauges for Plumbing Piping
X	X	22 05 23	General -Duty Values for Plumbing Piping
X	X	22 05 29	Hangers and Supports for Plumbing Piping and Equipment
X	X	22 05 53	Identification for Plumbing Piping and Equipment
X	X	22 07 19	Plumbing Piping Insulation
X	X	22 10 05	Plumbing Piping
X	X	22 10 06	Plumbing Piping Specialties
X	X	22 22 00	Laboratory Plumbing
X	X	22 30 00	Plumbing Equipment
X	X	22 40 00	Plumbing Fixtures

#### DIVISION 23 - HEATING VENTILATING AND COOLING

X	X	23 00 00	General Requirements for HVAC
X	X	23 05 93	Testing, Adjusting, and Balancing for HVAC
X	X	23 07 13	Duct Insulation
X	X	23 31 00	HVAC Ducts and Casings
X	X	23 33 00	Air Duct Accessories

#### DIVISION 26 - COMMUNICATIONS

X	X	26 05 19	Low-Voltage Electrical Power Connections and Cables
X	X	26 05 26	Grounding and Bonding for Electrical Systems
X	X	26 05 29	Hangers and Supports for Electrical Systems
X	X	26 05 33.13	Conduit for Electrical Systems
X	X	26 05 33.16	Boxes for Electrical Systems
X	X	26 05 33.23	Surface Raceways for Electrical Systems
X	X	26 05 36	Cable Trays for Electrical Systems
X	X	26 05 48	Vibration and Seismic Controls for Electrical Systems
X	X	26 05 53	Identification for Electrical Systems
X	X	26 05 83	Wiring Connections
X	X	26 09 23	Lighting Control Devices
X	X	26 22 00	Low-Voltage Transformers
X	X	26 24 16	Panelboards
X	X	26 27 26	Wiring Devices
X	X	26 28 13	Fuses
X	X	26 28 16.13	Enclosed Circuit Breakers

COALEDO HALL
SUMNER HALL

X	X	26 28 16.16	Enclosed Switches
X	X	26 43 00	Surge Protective Devices
X	X	26 51 00	Interior Lighting
X	X	26 56 00	Exterior Lighting
X	X	26 60 00	Laboratory Electrical Requirements

#### DIVISION 27 - ELECTRICAL

X	X	27 05 29	Hangers and Supports for Communications Systems
X	X	27 05 33.13	Conduit for Communications Systems
X	X	27 10 00	Structured Cabling

#### DIVISION 28 - ELECTRICAL SAFETY AND SECURITY

X	X	28 46 00	Fire Detection and Alarm
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#### DIVISION 31 - EARTHWORK

X	X
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As determined by Civil Engineer

#### DIVISION 32 - EXTERIOR IMPROVEMENTS

X	X
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As determined by Civil Engineer and  
Landscape Architect

#### DIVISION 33 - UTILITIES

X	X
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As determined by Civil Engineer

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**SECTION 22 00 00**  
**GENERAL REQUIREMENTS FOR PLUMBING**

**PART 1 – GENERAL**

**1.01 APPLICABLE REQUIREMENTS**

- A. All work to be furnished and installed under this section shall comply with Division 01 – General Requirements when available. If not available, the Contractor shall meet the requirements of these specifications.
- B. Where the Owner-Contractor Agreement contradicts this division, the more stringent shall apply.

**1.02 RELATED REQUIREMENTS**

- A. Codes to include latest adopted editions, including current amendments, supplements, and local jurisdiction requirements in effect as of the date of the Contract Documents, including state/local building code, mechanical code, plumbing code, electrical code, fire code, and energy code.

**1.03 GENERAL SCOPE**

- A. Work included in 22 00 00 applies to Division 22 work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of mechanical systems for proposed project.
- B. Contract Documents include, but are not limited to, Specifications, Drawings, Addenda, Owner/Engineer Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.
- C. In the event there is a discrepancy between the drawings, specifications and current code, the more stringent shall apply.
- D. Examine the Drawings, specifications and other Contract Documents relating to the Work and the work of all trades and become fully informed as to the extent and character of work required. Coordinate all work with that of others to ensure proper and complete installation of all materials, equipment and supports.
- E. Intent:
  - 1. The intent of the Contract Documents is for the Contractor to include all work necessary for the complete systems, tested and ready for operation (hereinafter "Design Intent").
  - 2. Provide all items not specifically shown on the drawings, called for in the specifications or related Contract Documents, but required to conform to the labor, material and equipment to achieve the Design Intent.
  - 3. Provide all scaffolding, access provisions, tools, appliances, consumables, debris removal/disposal, supervision and labor, including required start-up, check-out and training to provide complete and fully operable systems in full compliance with the Contract Documents.
  - 4. Before submitting a bid and prior to the start of work, Contractor shall examine all conditions relating to the Work, including that associated with the work of other trades upon which Contractor's work may rely or otherwise depend, to achieve the Design Intent, in accordance with the best trade practices, workmanship and highest quality product installation, taking into account the sequence of the work, delivery, storage and hoisting requirements, requirements for access, testing and temporary services and all other site limitations and project complexities. Report to the Architect/Engineer any conditions which might prevent installation of materials and/or equipment in the manner intended by the Contract Documents or contrary to applicable codes, standards or regulations.
  - 5. By submitting a bid, the Contractor represents that it has made a thorough examination of the site, of the work, including that associated with the work of other trades, all existing conditions and limitations, and that it has examined the Contract Documents in complete detail and has determined beyond doubt that the drawings, specifications, and existing conditions are sufficient, adequate and satisfactory for the construction of the work under the Contract.

6. No consideration or allowance will be granted for any alleged misunderstanding of materials, equipment or components to be furnished or work to be done; it being agreed that tender of proposal carries with it agreement to items, terms and conditions required by the Contract Documents.
  7. Where minor adjustments of the work are necessary for purposes of fabrication or installation of items, or resolution of conflicts between items within the intent of the Contract Documents, the Contractor shall make such adjustments with no added compensation. Where such adjustments affect functional or aesthetic design of the work, they shall first be submitted to the Architect for review and approval.
- F. Site Visit:
1. Contractor shall visit the site and verify the exact conditions relating to the work and obtain such information as may be necessary to present a complete and comprehensive bid. No allowance will be made for any extra expense due to Contractor's failure to make such a visit and reasonably verify all actual/existing conditions. In the event of a conflict between existing conditions and the requirements of the Contract Documents, perform the necessary work to conform to Design Intent. The Owner or his representative will be the sole individual to interpret the intent of the Drawings in the event of a conflict between (1) existing conditions and those shown on the drawings, or (2) quality of existing material and quality of material indicated on the drawings or in the specifications. Wherever a conflict such as this occurs, the higher standard shall prevail.
- G. Conditions:
1. Conform to all Bidding Requirements and General Conditions
  2. The Contractor is obligated to comply with the above in addition to the requirements of this Section.
  3. Modifications by this Section do not nullify any other portions of the above-referenced conditions.
- H. Make complete system installation, connecting to all equipment shown on the plans, or called for in the specifications. Contractor to provide any additional components not shown on plans to obtain design criteria as required for a complete system and by the balancing contractor.
- I. Drawings:
1. Drawings do not attempt to show all aspects of building construction, which will affect the installation of the systems. The drawings are diagrammatic and do not intend to show all offsets and fittings that may be required for a complete installation. Locations of equipment, pipes, valves, traps, ductwork, etc. shown on the drawings, shall be followed as closely as conditions will permit. Review all project drawings, including, but not limited to, architectural, structural, plumbing and electrical drawings; and coordinate with all trades involved so there is no conflict with work of other trades and so Owner secures best arrangement of work consistent with use of space.
  2. Verify exact distances between points shown on drawings by actual measurement at site, as no extra cost will be allowed for differences between actual measurements and scaled measurements on drawings.
  3. Changes in design, configuration, or location of equipment, piping, or ductwork, advisable in the opinion of Contractor, shall be submitted to Architect/Engineer for approval before proceeding with work, with written assurance from other trades that such changes will not interfere with their installation, nor cause any extra cost on their part. Such changes shall be made at no additional cost to Owner.
  4. Check location of all work of all trades and avoid interferences. Conflicts shall be reported to Architect/Engineer for decision and direction. Special attention is called to the following items:
    - a. Exact location of outlets shown on architectural details.
    - b. Location of suspended ceilings.

#### **1.04 SPECIAL REQUIREMENTS**

- A. When applicable, Contractor acknowledges the ongoing operations of the Owner at or in close proximity to the Project and agrees to coordinate the timing of the Work with the Owner's

ongoing operations; perform the Work in a manner that minimizes or eliminates and adverse impact upon the Owner's ongoing operations; confine operations at the site to areas approved by Owner, permitted by law, permits and the Contract Documents; comply with the Owner's standard security, health and safety policies and procedures; not unreasonably encumber the site with any materials or equipment; and not place signs or advertising on or about the site without prior approval of Owner.

- B. Where applicable, all seismic construction, restraints, bracing, mounts and hanging systems shall be in full compliance with the requirements of all Authorities Having Jurisdiction (AHJ's), pre-approval, certification and engineering (including certified engineering calculations and stamps). Contractor shall be solely responsible for obtaining and complying with all requirements of the AHJ.

#### **1.05 DEFINITIONS AND ABBREVIATIONS**

- A. Finished Spaces: Spaces other than mechanical, plumbing and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical, electrical and plumbing 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 spaces above hard or lay-in type 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 word "provide," means "furnish and install."
- G. The word "approved," means acceptance by the Architect or Engineer
- H. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the drawings, or other paragraphs or schedules in the specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.
- I. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted," mean directed by the Architect/Engineer, requested by the Architect/Engineer, and similar phrases.

#### **1.06 REFERENCE STANDARDS AND GUIDELINES**

- A. Include but are not limited to the latest adopted editions from:
  - 1. AABC: Associated Air Balance Council
  - 2. ADA: Americans with Disabilities Act
  - 3. AHRI: Air-Conditioning Heating & Refrigeration Institute
  - 4. AMCA: Air Moving and Conditioning Association
  - 5. ANSI: American National Standards Institute
  - 6. ARI: Air Conditioning and Refrigeration Institute
  - 7. ASHRAE: American Society of Heating, Refrigerating, and Air Conditioning Engineers
  - 8. ASME: American Society of Mechanical Engineers
  - 9. ASPE: American Society of Plumbing Engineers
  - 10. ASSE: American Society of Sanitary Engineering
  - 11. ASTM: American Society of Testing Materials
  - 12. AWWA: American Water Works Association
  - 13. AWS: American Welding Society
  - 14. CFR: Code of Federal Regulations
  - 15. CISPI: Cast Iron Soil Pipe Institute

- 16. EPA: Environmental Protection Agency
- 17. FM: Factory Mutual Engineering Corporation
- 18. Fed. Spec.: Federal Specifications
- 19. GAMA: Gas Appliance Manufacturers Association
- 20. IAPMO: International Association of Plumbing & Mechanical Officials
- 21. ISO: International Organization for Standardization
- 22. MSS: Manufacturers Standardization Society
- 23. NEBB: National Environmental Balancing Bureau
- 24. NEC: National Electric Code
- 25. NEMA: National Electrical Manufacturers Association
- 26. NFPA: National Fire Protection Association
- 27. OSHA: Occupational Safety and Health Administration
- 28. SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Inc.
- 29. UL: Underwriters Laboratories
- 30. WOG: Non-shock Water-Oil-Gas maximum working pressure rating

#### 1.07 SUBMITTALS

- A. Reference Division 1 for submittal requirements when available. If not available, the contractor shall meet the requirements of these specifications.
- B. Submittal Schedule – Provide a detailed submittal schedule including all requirements of this Division and its subdivisions to the Architect and Engineer within thirty (30) days of contract award.
  - 1. Contractor shall submit for the Engineer's approval a Submittal Schedule for the performance of the work that is consistent with the requirements of the project schedule. The Submittal Schedule shall allow reasonable time for the Architect and other consultants review. If the time for Architects/Engineers review is not otherwise specified, the review period (from date of receipt) shall be a minimum of ten (10) business days. Once approved by the Architect/Engineer, submittal dates and time limits established by the Submittal Schedule shall not, except for reasonable cause, be changed or exceeded by the Contractor.
  - 2. For each submittal required by the Contract Documents, the schedule shall include: specification section number, subsection/paragraph identification number, item description (as stated in the applicable specification section, subsection or other Contract Document) and the scheduled delivery date to the Architect/Engineer.
  - 3. Contractor shall be responsible to the Architect/Engineer and/or Owner for all costs, expenses and impact to the project schedule resulting from any deviation to the approved Submittal Schedule, including but not limited to: payment for required overtime, out-of-house resources/consultants or other higher cost resources of the Architect/Engineer as may be required to perform out of sequence, stacked, critical, delayed, unscheduled or multiple reviews of required submittals necessitated by rejection of a prior submittal, (cumulatively and hereinafter, "Additional Review Costs")
- C. General
  - 1. Review is for general conformance with the Contract Documents and is not intended to otherwise approve or verify dimensions, quantities, or to coordinate the Work shown on shop drawings on or between Contractor and the work of other trades or Sections. Contractor is solely responsible for quantities, dimensions, means and methods. Dimensions shall be confirmed and correlated by Contractor at the jobsite prior to the start of the Work (procurement, fabrication, construction or other commencement activities). Contractor's failure to fully verify conditions at the jobsite prior to commencement of the work shall not relieve Contractor of its obligations under the Contract Documents and Contractor shall be responsible for all damages caused by or related to its failure to comply with the requirements of this provision.
  - 2. Submittal review shall be performed to show compliance with the design intent. Contractor shall specifically note any deviations from the Contract Documents and explain the reason and nature of the deviation. Such deviations will be reviewed or rejected on the submittal. Deviations not so identified shall not relieve the Contractor from

the requirements of the Contract Documents.

3. Resubmittals will be reviewed for compliance with comment(s) made on the original submittal only. Architect/Engineer shall not be responsible for changes made upon resubmittal that are not clearly identified (highlighted), and responsive directly to the initial rejection. Resubmittals should not be packaged with non-related first-time submittals, all resubmittals must be marked with the resubmittal number and date and must otherwise comply with all submittal requirements.
  4. Submit product data, shop drawings, commissioning plan(s) and checklists, penetration locations, supplemental data, etc. as may be required by the Contract Documents for all materials, equipment and other components of the work included in all Sections of this Division and other provisions of the Contract Documents in accordance with the requirements of this Division and referenced sections.
  5. All submittals must be reviewed by Contractor, and bear Contractors review stamp and signoff for Conformity to the Contract Documents, prior to the submission of any required submittal to Architect/Engineer. Submittals that fail to meet this requirement will be considered incomplete, will not be reviewed by Architect/Engineer and will be returned to Contractor, without review and/or rejected and resubmittal will be required. Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
  6. Forward all submittals to Architect/Engineer in a coherent, organized fashion, complete and packaged as required herein, Architect/Engineer may reject submittals that fail to comply with this or any other provision of the Contract Documents and Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
  7. Subject to other provisions of the Contract Documents and in the absence of a more stringent requirement, Architect/Engineer will review a submittal not more than two (2) times. If a submittal is required to be reviewed more than twice due to incomplete, or incorrect information the contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
  8. Identify each submittal item by reference to Specification Section paragraph in which item is specified, or drawing/detail number, as applicable. In addition, for equipment submittals, include identification numbers appearing on the equipment schedule.
  9. Identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is necessary to properly identify and check materials and equipment. Words "as specified" are not sufficient identification.
  10. Organize submittals in same sequence as they appear in specification sections, articles or paragraphs.
  11. All materials and equipment submittals shall have a summary sheet at the front complete with catalog numbers. Where materials or equipment pertain to more than one building, submittals shall clearly indicate at which locations the materials or equipment is to be installed.
  12. Submittals shall show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping and/or conduit entrance, access requirements for installation and maintenance, physical size and dimension, electrical characteristics and requirements, foundation/curbs and all permanent and temporary support details as well as all information relating to weight, including but not limited to live and dead weights and other information necessary for component verification and coordination with other trades.
- D. Catalog Cuts & Submittal Literature
1. Catalog cuts, submittal literature and published material may be included to supplement scale drawings provided that the actual make and model of equipment being submitted on is identified.
  2. Submittal literature, drawings and diagrams shall be specifically applicable to this project and shall not contain extraneous material or optional choices. Clearly mark literature to indicate the proposed item.
- E. Shop Drawings:



1. Shop drawings shall include all systems, equipment, and components, including but not limited to all equipment, devices, connections and elevations. Include all related specialty rooms (i.e. mechanical, electrical, data/technology). Drawings shall be at a minimum scale of  $\frac{1}{4}$ " per 1'-0" and shall be fully coordinated with the work of other trades and/or sections.
2. Detail major elements, components, systems, equipment and materials in relationship with other systems, installations, and building components. Identify congested areas and clearly indicate solutions to space problems, developed in conjunction with the work of other trades and/or Sections. Identification of space problems without proposed solutions is not acceptable and is grounds for rejection. For such areas indicate, superimposed, the work of all trades and/or Sections involved and:
  - a. Clearly identify each area of congestion and deviations from the Contract Documents, and:
  - b. Proposed solution(s), clearly documented and signed-off by all other trades and/or Sections involved.
3. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
  - a. Planned system distribution layout, including specialty device locations and access for operation
  - b. Clearances for installing and maintaining insulation.
  - c. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
  - d. Equipment and accessory service connections and support details.
  - e. Other systems installed in same space.
  - f. Exterior wall and foundation penetrations.
  - g. Fire-rated wall and floor penetrations.
  - h. Ceiling and wall-mounted access doors and panels required to provide access to operating devices or items needing access for proper maintenance
  - i. Sizes and location of required concrete pads and bases.
  - j. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
  - k. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
- F. Anchorage and Supports: Submit details and calculations for support and anchors that are not specifically detailed on the drawings. All calculations must meet current seismic and structural code.
  1. Provide seismic restraints in accordance with ASCE Standard 7 requirements for piping, ductwork, and mechanical equipment.
  2. Provide engineering for seismic restraint system, assemblies, and components.
  3. Provide shop drawings and installation instructions for seismic restraint system.
  4. Provide final inspection and report for installed restraint system acceptance.
  5. Where pre-approved bracing systems will be employed, submit:
    - a. System component brochure describing components used and detailed installation instructions.
    - b. Loads to be transmitted to the structure at anchor points.
  6. Where anchorage, support, and bracing are not detailed on the drawings, and pre-approved systems are not used, submit details and calculations of proposed systems. Include:
    - a. Anchorage and Supports
      - 1) Where equipment substitutions change the weight, size, configuration, or other aspects of systems and equipment that will affect the performance of anchorages and/or supports, submit calculations for proposed anchors and supports, and install them as shown in these calculations.

- 2) Where substitutions will have no effect on anchors and supports detailed on Contract Documents, submit information on sizes, weights, center of gravity and other relevant information to demonstrate this fact.
7. Seismic Engineer: Professional engineer currently licensed in state where project is located as a structural, civil, or mechanical engineer. Responsible for designing, applying, and inspecting custom seismic restraint components in accordance with applicable codes.
- G. Shop Fabrication Drawings: Drawings are for the Contractor's use and shall be its responsibility. Do not submit shop fabrication documents unless specifically requested.
- H. Testing: Coordinate Shop Drawings to include any additional components for proper system testing.
- I. Certificates: Submit final inspection certificates signed by governing authorities.
- J. Operating and Maintenance Instructions and Manuals.
  1. Three (3) complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished to the Owner within ninety (90) days of issuance of final occupancy permit. Each set shall be electronic or permanently bound with a hard cover. The following identification shall be inscribed on the covers, "OPERATING AND MAINTENANCE INSTRUCTIONS", the name and location of the building, the name of the Contractor, and the Contract number. Flysheets shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8 1/2" x 11" with large sheets of Drawings folded in.
  2. PDF electronic file: Assemble each manual into a composite electronically indexed file.
    - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
  3. Instructions on major items, including but not limited to: pumps, air compressors, boilers, specialty units, fans, heat pumps, and temperature controls, shall be by representative of manufacturer of respective equipment.
  4. Submit as identified below and as noted in other specification references.
    - a. Names, addresses and phone numbers of contractors and subcontractors. List of all system components, with the name, address, and 24-hour phone number of the company responsible for servicing each item during the first year of operation.
    - b. Complete operating and maintenance instructions and parts lists of all equipment and component parts. Data sheets to show all connections, ratings, characteristics, wiring connections, catalog data on component parts whether furnished by equipment manufacturer or others, names, addresses and telephone numbers of source of supply for parts subject to wear or failure, and description of operating, test, adjustment, and maintenance procedures.
      - 1) Where data sheets included in manual cover equipment, options, or other features not part of equipment actually furnished, line out these references or otherwise clearly mark so remaining text, diagrams, drawings, schedules, and similar information shall apply specifically to equipment furnished.
    - c. Operating Instructions should include, but not be limited to:
      - 1) Normal starting, operational and shutdown procedures, including emergency procedures for each type of equipment/system.
      - 2) Equipment wiring and control diagrams.
      - 3) All other items as may be specified/required by this Section and the Contract Documents.
    - d. Maintenance Instructions
      - 1) All items as may be specified/required by this Section and the Contract Documents.
    - e. Manufacturers Data (each piece of equipment)
      - 1) Installation instructions
      - 2) Drawings & specifications
      - 3) Parts List, including recommended stock and long lead parts/components.
      - 4) Wiring and riser diagrams.

- 5) Warranties and guarantees for all equipment, materials and components, including repair, replacement and labor from both Contractor and manufacturer as required by the Contract Documents.
  - 6) Certificates of Installation – manufacturer's certification of supervision during equipment installation and start-up procedures.
  - 7) All other items as may be specified/required by this Section and the Contract Documents.
- K. Record Documents.
1. Maintain one (1) complete set of prints and specifications at the job site exclusively for recording deviations from the drawings which are necessary because of job conditions, request for information and/or approved change orders. Record locations and depths of buried and concealed system components from fixed, easily identifiable objects, such as building walls or other fixed physical objects. Where systems are concealed in walls or other fixed physical objects, indicate distances from building corners or other building features not likely to be disturbed by future alterations.
  2. Submit Record Drawings within 90 days of system acceptance by owner.
- L. Drawings, specifications (as-builts) and approved submittals.
1. Where the project uses a BIM model the contractor shall keep the model updated in a similar fashion, maintaining the current project record as described above and submit, in addition to all other requirements of this Section and other provisions of the Contract Documents a complete and accurate BIM model for the project.
  2. Prior to Substantial Completion, obtain from the Architect a complete set of printed drawings at the Contractor's cost. Record all revisions to these drawings to indicate as-built conditions. Indicate all changes, including RFI's, on this set of documents. Submit one set of blueprints of these revised drawings for review. Make necessary changes and deliver to Architect one set of electronic documents, including any BIM model, upon Final Completion and Acceptance.
  3. All test reports, certifications, and inspection reports.
  4. AHJ/Specialty AHJ Approvals (i.e. Fire Marshal and/or Fire Department system approvals).
  5. Substantial and Final inspection certificate signed by governing authorities.
  6. All other items as may be specified/required by this Section and/or other provisions of the Contract Documents.
- M. Definitions of comments used in submittal review:
1. "No Exception Taken" The meaning and intent of this statement is that the Engineer finds no objection (except those noted thereon or in correspondence) to inclusion of items or Work indicated in construction provided that it:
    - a. Complies with Contract Drawings and Specifications as to quantities, space requirements, and dimensions.
    - b. Does not interfere with other trades.
    - c. Is not the cause of union tradesmen disputes.
    - d. Does not infringe on patent rights.
    - e. Is not the cause of injury or damage to persons or property.
    - f. Complies with OSHA regulations.
  2. "Rejected" The meaning and intent of this statement is that the submitted material does not conform to plans and specifications. Resubmittal of a different product or shop drawing is required.
  3. "Revise and Resubmit" This statement is used when the general product line is acceptable, but the submitted material varies in dimension, accessories, etc. from what is required. Resubmittal is required.
  4. "Make Corrections Noted" This statement is used as an alternative to "Revise and Resubmit" when resubmittal is not required.
  5. Said review does not relieve Contractor of any Contractual responsibilities.

#### **1.08 TEMPORARY FACILITIES AND CONTROLS**

- A. Refer Division 01 – General Requirements when available. If not available, the Contractor shall meet the following requirements.
- B. Use of Project equipment for temporary service during construction is not allowed.

#### **1.09 EQUIPMENT DEVIATIONS AND SUBSTITUTIONS**

- A. Substitutions will only be considered after project award. No substitutions will be considered during bid and/or negotiation periods.
- B. See Division 1 for requirements and procedures related to Deviations and Substitutions. Unless specified elsewhere in the Contract Documents, a minimum of ten (10) business days shall be allowed for evaluation. The burden of all systems re-engineering/design, testing, suitability, and constructability is solely placed upon the Contractor for all deviations from the basis of design as reflected in the Contract Documents.
- C. No substitutions will be allowed and/or considered unless the description of a product includes the phrase “approved equal” and then only upon a determination as to equivalency and impact upon the project budget, schedule, and the work of others, including any redesign of the project or its system components by the Architect, Engineer, or other trades. The final determination as to sufficiency or acceptance of any such substitution and/or deviation properly requested and submitted by Contractor will lie solely with the Architect/Engineer. Contractor may not implement substitutions that have not been approved by Architect/Engineer.
- D. Where the contractor proposes to use an item or equipment other than that specified or detailed on the drawings which requires any redesign of any portion of the project, including but not limited to the mechanical, electrical, plumbing, structure, or architectural design or any of their respective subcomponents. Contractor shall be responsible to the Architect/Engineer and/or Owner for all costs, expenses and impact to the project budget and/or schedule resulting from any required investigation, analysis or redesign, including but not limited to; payment for required overtime, out-of-house resources/consultants or other higher cost resources of the Architect/Engineer, Owner or AHJ as may be required to perform the investigation, analysis or redesign (cumulatively and hereinafter, “Deviation Review Costs”)
- E. If approved by Architect/Engineer, all such redesign, including all new drawings and detailing required, will be prepared by the Architect/Engineer and their sub-consultants for Change Order documentation for approval by Owner and the Authority Having Jurisdiction will be paid by the Contractor as part of the Deviation Review Costs.

#### **1.10 COORDINATION**

- A. Prior to construction, coordinate installation and location of systems, devices and equipment with architectural and structural requirements, and other trades (including ceiling suspension, and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.
- B. Drawings and corresponding electronic media are diagrammatic and indicate the general arrangement of systems and work included in the Work. Consult the drawings, details and other electronic media for locations of fixtures and equipment; where same are not definitely located, obtain this information from the Architect/Engineer.
- C. Check drawings and related electronic media of other trades to verify spaces and conditions in which work will be performed prior to commencement of the work.
- D. If directed by the Architect/Engineer or required for proper installation, execution and coordination of the work, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed.
- E. Take all dimensions from Architectural and Structural Drawings, certified equipment drawings and from the actual field measurements before fabricating work. All conflicts shall immediately be reported to the Architect/Engineer. Contractor is solely responsible for conflicts known or which reasonably should have been know but not reported or resolved before commencement

of the work

- F. Equipment furnished shall fit in allocated space with due provision for manufacturer's recommended access and proper maintenance requirements. Verify and coordinate space requirements with all trades and equipment which comprise the Work.
- G. Prior to construction, coordinate the Work with that of other trades and building components. Prepare coordination drawings (or other specified electronic media) for all major trades, utilities and other primary systems routing in conjunction with the contract documents to maximize the pre-installation planning and coordination of trades, utilities and systems and minimize the requirement to manage field coordination through the RFI's, ASI's or other similar processes.
- H. Coordinate connection of systems with interior/exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- I. Before submitting a bid for the work the Contractor shall visit the site and become familiar with all the work on other related Drawings and Specifications, and plan the work to provide the best possible assembly of the combined work of all trades. No additional costs will be considered for work which has to be relocated due to conflicts with other trades.
- J. If, after examination of the bidding documents relating to the work, the Contractor has queries concerning the nature and scope of the work or intent of the Specifications, he/she shall promptly request clarification from the Architect/Engineer. After contract award, claims of ignorance of the intent and scope of the contract shall not be allowed.
- K. Contractor is responsible for coordinating the schedule of inspections by Engineer at appropriate stages of construction such as rough-in, pre-final, and final, and at other times required by the Specifications or by the construction. Notify Architect and Engineer ten (10) business days in advance of proposed site visit. Notification constitutes certification that construction is, or will be, complete and ready for observation. In the event that construction is not ready for observation, contractor shall bear the cost of additional site visits.

#### **1.11 ACCESSIBILITY**

- A. Contractor is responsible for verifying that equipment and devices will fit within the space shown on the drawings. Contractor shall locate all equipment which must be serviced, operated or maintained, in fully accessible locations.
- B. Minor deviations from the drawings may be made to allow for better accessibility, but changes of magnitude or which involve extra cost shall not be made without approval from the Architect/Engineer.

#### **1.12 QUALITY ASSURANCE**

- A. Regulatory Requirements: Work and materials installed shall conform with all local, State, Federal and other applicable laws and regulations.
- B. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.
- C. Conform to all applicable standards, codes and regulation and industry best practice requirements.
- D. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.
- E. All materials and equipment shall be new, shall bear manufacturer's name, and shall conform to the grade, quality and standards specified herein. Type, capacity and application shall be suitable and capable of satisfactory operation for the purpose intended. All equipment and components shall include UL label and/or marking on equipment body/device including manufacturer's name, pressure rating(s), electrical classification(s), limits and ratings as applicable to individual components for the purpose specified and intended.
- F. Equipment Selection: Equipment allowed by the specifications but with different electrical characteristics, physical dimensions, capacities, and/or ratings than what is shown on the

Drawings may be furnished, provided such proposed equipment is approved in writing and connecting mechanical and electrical services, such as pipe and/or duct connection sizes, circuit breakers, conduit, motors, bases, and equipment spaces are revised to accommodate such equipment. Maintain a minimum duct length of three straight diameters at all fan inlets and outlets. All expenses shall be borne by the Contractor. Specified minimum energy ratings and/or equipment efficiencies must meet design and commissioning requirements.

- G. ASME Compliance: ASME listed water heaters and boilers with an input of 200,000 BTUH and higher, hot water storage tanks which exceed 120 gallons, and hot water expansion tanks which are connected to ASME rated equipment or required by code or local jurisdiction.
- H. Provide safety controls required by National Boiler Code (ASME CSD 1) for boilers and water heaters with an input of 400,000 BTUH and higher.
- I. Listing and labeling: Provide motors that are listed and labeled. Terms "listed and labeled": as defined by UL, NEC, Article 100 or other applicable recognized agency as specified in the Contract Documents.
- J. Cutting & Patching: Unless otherwise required by the Contract Documents, Contractor shall be responsible for all cutting, fitting and patching required to complete the Work, or to make portions of the Work and existing conditions fit together properly, and all such areas shall be restored to the conditions existing prior to the cutting, fitting and patching unless otherwise provided in the Contract Documents
- K. Lead Free Requirements: Contractor shall use lead free products and where required by law, ordinance, regulation or standard, all materials products and practices shall comply with limitations and requirements as to the allowable limits and/or percentages of lead. Lead free products must be certified by and independent 3rd party.
  - 1. This provision shall apply to any and all similarly regulated materials, products and practices that may be considered hazardous or are otherwise regulated by applicable law, ordinance regulation or standard in the project local.

#### **1.13 DELIVERY, STORAGE, AND HANDLING**

- A. All materials and equipment shall be adequately covered and protected against dirt, water, chemical or mechanical damage, and theft. At completion, all work, equipment and materials shall be cleaned, and damage repaired by Contractor. Damaged equipment will be replaced by the contractor if Owner does not accept repairs done to the equipment. Such replacement shall be scheduled to minimize building system interruption of occupied or scheduled for occupancy.
- B. Material delivered at the site shall not be left exposed to the weather or left unattended. Deliver pipes, tubes and conduit with factory-applied end-caps. Contractor shall be responsible to maintain end-caps or provide temporary end caps on all open-ended piping, tubes and conduit through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.
- C. Protect bright finished shafts, bearing housings and similar items until in service.
- D. Protect plastic pipes and materials from sunlight and support to prevent sagging and bending.
- E. Elevate stored materials above grade. When stored inside, do not exceed structural capacity of the floor.
- F. Provide protective coatings to materials to prevent damage and/or infiltration of moisture and dirt on all materials and equipment including but not limited to cast iron and steel valves.
- G. Contractor shall check the openings in the building and the size of the doors, passages, and openings through which equipment is to be admitted. Wherever necessary, he shall provide the equipment in sections or knocked down in order to admit the equipment through these openings.
- H. Contractor shall provide all rigging, erection and hoisting equipment as required to handle or place equipment and piping in position. This rigging and hoisting equipment shall only be attached and placed on the structure in locations as approved by Architect/Engineer at the site. Section 016000 "Product Requirements."

#### **1.14 PERMITS AND FEES**

- A. Contractor shall arrange and pay for all permits, fees, and inspections required to perform the Work. The Contractor shall present the Owner with properly signed certificates of final inspection before the Work will be accepted.
- B. Contractor shall call for all inspections by local building official(s) when they become due, and shall not cover any work until approved by these governing authorities.
- C. Contractor shall make all arrangements with utility companies for water, steam, gas and drainage services, etc., associated with the work and include required payments for meters, piping, services, connection charges and materials furnished and installed by utility companies. Work and materials shall be in strict accordance with rules of respective authorities.

#### **1.15 DOCUMENT OWNERSHIP**

- A. The Drawings and Specifications, combined with the calculations, field data, notes, and reports, are the intellectual and real property of the Architect and/or Engineer. This covers all forms of written and recorded or electronic media. The reuse of these documents without specific permission of the Architect and Engineer is prohibited. The Drawings may be employed by the Owner and Contractor for the express use of constructing, commissioning and operating the facility only upon proper execution of an Agreement for Use of Electronic Files & Data.

#### **1.16 GUARANTEE AND WARRANTY**

- A. Refer Division 01 – General Requirements when available. If not available, the Contractor shall meet the following requirements.
- B. Contractor warrants to Owner that the materials and equipment provided under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects. Work, materials and equipment not conforming to these requirements, including substitutions not properly approved by Change Order, shall be considered defective. This warranty excludes remedy for damage caused by improper or insufficient maintenance, improper operation or normal wear, tear and usage. Contractor shall assign to Owner, or otherwise assure the Owner has the full benefit of, all warranties and guarantees of manufacturer, subcontractors, sub-subcontractors and suppliers, and Contractor shall perform the Work in a manner that does not adversely affect or invalidate any available warranties or guarantees.
- C. Contractor shall warrant and guarantee all work against faulty material or workmanship for a period of one (1) year from the date of final completion and written acceptance by the Owner, unless specified more stringently elsewhere in the Contract Documents.
- D. If the project is occupied or the systems placed in operation in several phases at the request of the Owner, the guarantee of each system or piece of equipment used shall begin on the date each system or piece of equipment was placed in satisfactory operation, tested, commissioned and accepted, in writing, by the Owner. The use of building equipment for temporary service and testing or phases of work completed prior to the projects final completion and acceptance by the Owner does not constitute the commencement of the warranty period.
- E. If a defect or deficiency in the Work is discovered within the one (1) year Warranty & Guarantee period or within such longer period as may be prescribed by the Laws or by any specific guarantee, and Owner elects to have Contractor correct such defect or deficiency, Owner shall notify Contractor of such defect or deficiency in writing. This period of correction relates only to the specific obligation to correct defects and deficiencies and in no way otherwise limits the Contractor's responsibility for Work that is not in accordance with the Contract Documents, If Contractor fails to timely correct defects or deficiencies in the Work, Owner may, at its sole option, correct them and charge contractor for all cost therefore.
- F. Specific exclusions, if any, from this one (1) year warranty and guarantee period are listed in the individual specification sections.

### **1.17 LIMITATIONS OF LIABILITY**

- A. To the extent any of the following provisions are not more stringently included in the Contract Document the following Limitations of Liability shall apply:
- B. Architect/Engineer is not responsible for Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, and is not responsible for Contractor's failure to perform or furnish the work in accordance with the Contract Documents.
- C. In the event that Architect/Engineer's employees or sub-consultants make comments or issue warnings about safety issues, such comments and warnings shall be considered to have been offered by a Good Samaritan and shall not impose any obligation or responsibility.
- D. Engineer will not be responsible for the acts or omissions of Owner, Contractor, any subcontractor, any supplier, or of any other person or organization performing or furnishing any of the portions of the work
- E. Contractor understands and acknowledges that Engineer is not authorized to order extra work or issue Change Orders to the work, however in the event and to the degree that Engineer may offer advice, suggestions, and opinions Contractor shall not rely on such advice, suggestions, and opinions unless directed in writing by Owner or its designated representative, and shall, in no event, make any claim against the Engineer for any such advice, suggestions, and opinions.
- F. To the fullest extent permitted by law, Contractor shall indemnify and hold harmless Architect, Engineer, and their joint ventures, officers, directors, partners, employees and agents from and against any and all claims, costs, losses and damages (including but not limited to all fees and charge of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused in whole or in part by the negligent acts or omissions of Contractor, Contractor's officers, directors, partners, employees, agents; or contractor's subcontractors or material men in the performance of Work. Contractor shall direct its insurer to list Architect, Engineer, and their joint ventures, as Additional Insureds on general liability insurance policies covering this project. Prior to commencing work, Contractor shall submit copies of its certificate of insurance to both Architect and Engineer.

### **1.18 SAFETY**

- A. Contractor shall comply with all OSHA regulations. Contractor is required to obtain and pay for insurance required to cover all activities within Contractor's Scope of Work.

## **PART 2 – PRODUCTS**

### **2.01 MANUFACTURERS**

- A. See Drawings for equipment data, capabilities, and requirements. Manufacturers are identified for the purpose of establishing quality; alternative manufacturers of equal quality are acceptable. If alternative manufacturers are proposed it is the contractor's responsibility to verify and demonstrate the proposed alternative is equivalent.
- B. Provide like items from one manufacturer, including but not limited to pumps, pipes, fittings, valves, control devices, water heaters, etc.

### **2.02 MATERIALS**

- A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL approved or have adequate approval or be acceptable by State, County, and City authorities. Provide all materials omitted herein but necessary to complete the work.
- B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.
- C. All electrical materials shall bear the label of, or be listed by, the Underwriters' Laboratories (UL), unless the material is of a type for which label or listing service is not provided.
- D. Hazardous Materials: Comply with local, State and Federal regulations relating to hazardous materials. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials



will be removed by Owner under separate contract.

## **2.03 ACCESS PANELS**

- A. Confirm Access Panel requirements in individual Division 23 sections. Comply with the following:
  - 1. Provide flush mounting access panels for service of systems and individual components requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly. Ceiling access panels to be minimum of 24 x 24 or as required and approved size. Wall access panels to be minimum of 12 x 12 or as required and approved size.
  - 2. Coordinate final door location with the devices which require access and architectural finishes.

## **2.04 DRAIN PANS**

- A. Provide drip pans under all hot water heaters, above-ceiling inline pumps, cooling coils and heat recovery coils. Locate pan immediately below piping and equipment, and extend a minimum of 6" on each side and lengthwise 18" beyond equipment being protected. Pans shall be 2" deep and fabricated from reinforced sheet metal (20 gauge copper or 20 gauge steel with two ounces zinc finish hot dipped after fabrication) with rolled edges and soldered or welded seams. Provide 3/4" copper drainage piping, properly discharged to floor drain, hub drain, or as shown on Drawings. Provide condensate pumps as necessary. Comply with Oregon Mechanical Specialty Code for overflow protection and pipe sizing.

## **2.05 GUARDS**

- A. Provide guards in accordance with State Safety Code and OSHA requirements over all rotating equipment including belts, shafts and couplings. Drive guards over belts and sheaves shall include 2-1/2" diameter access opening at shaft ends for speed counter.

## **2.06 PENETRATION FIRE STOPPING**

- A. Through-penetration fire stopping system tested and listed by Underwriters Laboratories and ASTM E 814-88: Standard Test Method for Fire Tests of Through-Penetration Firestops.
- B. Select system for proper application based on wall construction, type of penetrating item, wall rating, etc. Each product shall be listed for use in its intended application.
- C. Fire Stop assembly shall be able to withstand standard fire and hose stream test (F Rating) and limit temperature rise (T Rating) of penetrations on protected side as required by Authorities Having Jurisdiction. Conform to ASTM E 814.

## **2.07 MISCELLANEOUS STEEL**

- A. Provide all steel as required for adequate support of all mechanical equipment. Use standard angle or channel, I or H sections as required by application. Adequately cross-braced and welded pipe stands may be used for tank supports. Provide suitable base plates for all stands and anchors for all hanging equipment. Drill or burn support holes only in flanges of structural shapes and only in one leg of any one angle, and as far from center of length as possible.
- B. Paint: Apply one coat of black Rustoleum primer to shop fabricated items before delivery to the job; other painting as specified herein.

# **PART 3 – EXECUTION**

## **3.01 GENERAL INSTALLATIONS**

- A. General: Sequence, coordinate, and integrate the various elements of the systems, materials, and equipment. Comply with the following requirements:
  - 1. Coordinate systems, equipment, and materials installation with other building components.
  - 2. Verify all dimensions by field measurements.
  - 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for system installations.
  - 4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

5. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
  6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
  7. Coordinate connection of systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
  8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
  9. Install systems, materials, and equipment level and plumb, and parallel or perpendicular to other building systems and components, where installed exposed in finished spaces.
  10. Install equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
  11. Install access panel or doors where units are concealed behind finished surfaces. Coordinate with other divisions.
  12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
  13. Replace all filters with new filters upon Owner taking occupancy of the building or at a time mutually agreed upon between the Owner and Contractor.
  14. Do not install ductwork or piping in elevator machine rooms, electrical and/or communication rooms unless it directly services that room.
- B. Locate wall, floor and ceiling fire ratings from architectural drawings for appropriate hourly rating of combination fire/smoke dampers or fire dampers shown on mechanical drawings.

### **3.02 CONTINUITY OF SERVICE**

- A. Contractor, in the performance of the Work shall plan for and incorporate into the work the continuity of services. Where the continuity of service(s) is required to be interrupted Contractor shall plan and schedule the work to minimize interruptions to the facility and its normal operations, prearrange and coordinate all outages/interruptions with Owner's representative, utilities and the work of others. Requests for system interruptions/outages must be submitted at least (5) days prior to intended shutdown time and then subject to Owner's adjustment and/or approval.
- B. For connections that require a significant interruption to facility operations (as determined by the Owner), Contractor shall provide for Owner's written approval a detailed plan, schedule and description of the work for each system interruption. The plan shall include a description and schedule of each work item to be completed, designation of site supervisor and contact information, designated work crew as well as facility access and egress points for materials, manpower and equipment, contingency plan for parts, materials and equipment as well as a program to restore systems in the event of unplanned disruption or inability to complete the work in the timeframe scheduled and approved by Owner. Contractor shall confirm scheduled dates with the Owner and provide a minimum of five (5) days advance notice for each operation.
- C. Where possible and subject to Owners sole discretion, connections to existing systems shall be performed during normal operating conditions. Unless required otherwise (specifications, code, practice, etc.) all tap connections shall be 'live', 'wet' or 'hot'", with the proper safety programs and procedures for isolating system components to ensure the safety of the workforce, occupants and the facility.
- D. Contractor shall include all costs for overtime labor, expedited materials, equipment and contingency planning as necessary to maintain continuity of services, schedule and complete necessary connections. Contractor shall also include provisions for maintaining any and all

supplemental systems that may be required to remain in service for the safety, protection and critical operations of the facility and its occupants including but not limited to: Fire Alarm, Security, Phone/Data, BAS, Emergency Power and similarly related critical or emergency systems. Such provisions shall include but not be limited to temporary power, lighting, materials, equipment and/or installations (including removal and cleanup thereof) required to maintain such systems and as required to safely and properly complete the work.

- E. Contractor shall be liable for any and all damages resulting from unscheduled outages/interruptions or for those not confined to the pre-approved timeframes to complete the work.

### **3.03 DEMOLITION**

- A. Comply with individual Division 22 sections and the following:
  - 1. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas.
  - 2. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve utilities. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.
  - 3. Equipment: Unless otherwise directed, equipment, fixtures, or fittings being removed as part of demolition process are Owner's property. Remove other items not scheduled to be reused or relocated from job site as directed by Owner.
  - 4. Unless specifically indicated otherwise on Drawings, remove exposed, unused systems to behind finished surfaces (floor, walls, ceilings, etc.). Cap and patch surfaces to match surrounding finish.
  - 5. Unless specifically indicated otherwise on Drawings, remove unused equipment, fixtures, fittings, rough-ins, and connectors. Removal is to be to a point behind finished surfaces (floors, walls, and ceilings).
- B. If duct, pipe, insulation, conduits, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Reuse of Materials: Reuse of materials is prohibited unless specifically indicated or approved by Architect.
- D. Notify Architect in discovery of any hazardous materials.
- E. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

### **3.04 PLUMBING SYSTEMS - COMMON REQUIREMENTS**

- A. General: Install Plumbing systems as described below, unless piping Sections specify otherwise. Individual Division 22 Sections specify unique installation requirements.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of systems. Indicated locations and arrangements were used to size pipe and duct and calculate friction loss, expansion, pump sizing, fan sizing, and other design considerations. Install piping and ductwork as indicated, unless deviations to layout are approved on Coordination Drawings.
- C. Install piping at indicated slope.
- D. Install components with pressure rating equal to or greater than system operating pressure.
- E. Install piping and ductwork in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping and ductwork free of sags and bends.
- G. Install exposed interior and exterior piping and ductwork at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- H. Install piping and ductwork tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

- I. Install piping and ductwork to allow application of insulation plus 1-inch clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. Install flexible connectors according to manufacturer's written instructions, and where indicated and specified in other Division 22 sections.
- L. Install flexible expansion loops according to manufacturer's written instructions, and where indicated and specified in other Division 22 sections.
- M. Install fittings for changes in direction and branch connections.
- N. Install couplings according to manufacturer's written instructions.
- O. Install Portable Instrument Connections in all piping systems where DDC temperature and/or pressure sensors and thermometers and/or pressure gauges are located.
- P. Do not route piping through elevator equipment rooms, unless specifically allowed by local authority.
- Q. Do not route piping over electrical panels, transformers, switchgear or other electrical equipment.
- R. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
  - 1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish. Use split-casting escutcheons if required, for existing piping.
  - 2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
  - 3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
  - 4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
  - 5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.
- S. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
- T. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 1. Build sleeves into new walls and slabs as work progresses.
  - 2. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
    - b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
    - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. If available, refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
      - 1) Seal space outside of sleeve fittings with non-shrink, nonmetallic grout.
    - d. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.
- U. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing sleeve seals.
  - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
  - 2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
  - 3. Assemble and install sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

- V. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using sleeve seals. Size sleeve for manufacturer's recommended clear space between pipe and sleeve.
  - 1. Assemble and install sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
  - 2. Caulk exterior side of annular space once the sleeve seal is in place using an elastomeric joint sealant.
- W. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe and duct penetrations. Seal pipe and duct penetrations with firestopping materials. If available, refer to Division 7 Section "Firestopping" for materials.
- X. Verify final equipment locations for roughing-in.
- Y. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- Z. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
  - 1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
  - 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
  - 3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
  - 4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
  - 5. 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:
  - 6. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
  - 7. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
  - 8. Align threads at point of assembly.
  - 9. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
  - 10. 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.
    - a. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators.
    - b. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench to recommended torque values.
- AA. Piping Connections: Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
  - 2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
  - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.
- BB. Identification
  - 1. Valves:

- a. Attach 1 1/2" square brass tags stamped with designating number 1/2" high, filled in with red enamel, to each valve.
  - b. Securely fasten valve tag to valve spindle or handle with a brass chain.
2. Schedules and Charts:
  - a. Furnish to Owner's representative three (3) complete framed plastic laminated valve tag schedules. Schedule shall indicate tag number, valve location by floor and nearest column number, valve size and fire area controlled.
  - b. Furnish three (3) framed plastic laminated diagrammatic charts showing schematically the complete sprinkler system, with major control valves and valve numbers.
  - c. Furnish one (1) framed plastic laminated placard at each sprinkler riser, indicating the basic hydraulic data as required by NFPA 13 or local Fire Marshal.
3. Piping Identification:
  - a. Apply color coded polyvinyl chloride pipe bands identifying service and direction of flow.
  - b. On exposed piping, apply bands at 20'-0" on centers at straight runs, at valve locations, and at points where piping enters and leaves a partition, wall, floor, or ceiling.
  - c. On concealed piping installed above removable ceiling construction, apply bands in manner described for exposed piping.
  - d. On concealed piping installed above non-removable ceiling construction, or in pipe shafts, apply bands at valves or other devices that are made accessible by means of access doors or panels.
  - e. Apply bands at exit and entrance points at each piece of equipment.
  - f. Band widths shall be 8" for pipes up to 10" diameter, and 16" for larger diameter piping. Letter heights stating service shall be pre-printed on band, 3/4" high for 8" bands and 1 1/4" high for 16" bands.
  - g. Colors shall conform to ANSI Standard A13.1.
  - h. Letter size shall conform to ANSI A13.1.
  - i. Tags and bands shall be approved for this service.

### **3.05 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS**

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated. Supports shall be neatly placed and properly fastened. All equipment shall be fastened in place with bolts.
- D. Install 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.

### **3.06 ERECTION OF METAL SUPPORTS AND ANCHORAGE**

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor materials and equipment.
- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

### **3.07 DRAWINGS**

- A. The Drawings show the general arrangement and location of the ductwork, piping and equipment. Work shall be installed in accordance with the Drawings, except for changes required by conflicts with the work of other trades. The Contractor shall provide for the support, expansion, and pitch of any rearranged piping in conformance with the intent of the Drawings, Specifications, and codes.
- B. Note that certain plumbing work is shown, wholly or in part, on Architectural Drawings.

- C. Plumbing Drawings are diagrammatic and are intended to show the approximate location of equipment and piping. Dimensions shown on Drawings shall take precedence over scaled dimensions on Drawings. All dimensions shall be verified in the field by the Contractor.
- D. The exact location of apparatus, equipment, and piping shall be ascertained from the Owner or the representative in the field, and work shall be laid out accordingly. Should the Contractor fail to ascertain such locations the work shall be changed at Contractor's own expense when so ordered by the Owner. The Engineer and owner reserve the right to make minor changes in the location of ductwork, piping and equipment up to the time of installation without additional cost.
- E. It is the intention of the Drawings and Specifications that, where certain mechanical items such as unions, expansion joints, and other mechanical components are not shown, but where such items are required by the nature of the work, shall be furnished and installed.
- F. The Plumbing Drawings and Specifications are intended to supplement each other. Any material or labor called for in one shall be furnished even though not specifically mentioned in the other.
- G. Pipe and duct sizes shown are the minimum allowable and shall be increased in size if required by code or wherever necessary to meet unusual conditions.

### **3.08 DAMAGE**

- A. Repair any damage to the building, premises, and equipment occasioned by the work under this Section and all other Sections.
- B. Repair all damage to any part of the building or premises caused by the Work installed under this Section until the warranty period expiration date.

### **3.09 EARTHWORK**

- A. General: Perform earthwork required for installation of new work below grade in accordance with referenced specifications.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of the pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated. Grade trench bottoms to provide uniform bearing and support for each section of pipe. Form holes and depressions for joints after trench bottom has been graded. Provide temporary pumping equipment to keep excavation free from water. Install pipe bedding in rock excavation consisting of not less than 6 inch of sand or equivalent material.
- C. Provide bracing and shoring as necessary.
- D. Backfill trenches only after completion of pressure tests and inspection. Carefully compact material under pipe and bring backfill evenly up on both sides and along the full length of piping or conduit. Cover to 12-inch thickness over top of pipe. Fill and tamp remainder of backfill material in 6-inch layers. Provide backfill materials generally consisting of clean earth or sand relatively free of clods or stones. For sewer and water piping, use pea gravel. For gas piping, use sand. Backfill under, around, and to 6 inches above top of piping.
- E. Compact soil to 6-inch layer (maximum) loose thickness of backfill. Where roadway or parking area surfaces will be placed over backfill, provide moisture conditions, which will produce compacted density of 95 percent of maximum density. Elsewhere, 90 percent. Test in accordance with Divisions 1 and 2 (if applicable) and local code requirements (most stringent to prevail).
- F. Take special care in compacting under services where they enter building to prevent settling. Contractor fully responsible for damage to piping and property as a result of settling around service piping.
- G. Dispose surplus materials off-site in a suitable location.
- H. Place and maintain barricades, construction signs, torches, lanterns, and guards as required during periods of open excavation to protect persons from injury and to avoid property damage.
- I. Leave premises thoroughly clean at completion of earthwork.

- J. Wherever piping is to be installed in areas, which have been excavated below pipe inverts, for any purpose, install piping to prevent subsequent settlement. Do not install piping until backfill is to full compaction, completed to minimum 18 inch above installed pipe. Install piping in re-excavated trenches and backfill as previously specified.

### **3.10 CONCRETE WALLS AND CONCRETE FOOTINGS**

- A. Where pipes must pass through concrete walls and footings, they shall pass through SDR 35 PVC pipe sleeves with 1/2" annular space set in place at time of construction.
- B. Ducts shall pass through 10 gauge galvanized sheetmetal sleeves. Provide sheetmetal closure collars at duct penetration.
- C. Sheetmetal sleeves set into concrete walls: Provide steel frame around opening where required by Structural Engineer.
- D. Coordinate core drilled openings with General Contractor. Coordination shall include location, size, and spacing of openings. No slot openings will be allowed. Coordinate openings to avoid critical structural items such as reinforcing bars, tensioning tendons, etc.

### **3.11 ELECTRICAL REQUIREMENTS - CONTROLS AND COORDINATION WITH ELECTRICAL CONTRACTOR**

- A. Contractor shall coordinate with the Electrical Contractor on furnishing and installing of controls, motors, starters, etc. Coordinate means informing Electrical Contractor of items requiring electrical connection, providing copies of submittal data, installation data, scheduling work to ensure efficient progress, and promptly supplying those items to be installed by Electrical Contractor.
- B. The specific requirements for electrical power and/or devices for each and every piece of equipment requiring electrical service, supplied and/or installed under this Contract, shall be coordinated and verified with the Plumbing drawings and specifications, and with the manufacturers of the equipment supplied. This shall include the voltage, phase, and ampacity; conduit requirements; and exact location and type of disconnect, control, and/or connection required. Any changes from the Drawings and Specifications required as a result of this coordination shall be part of this Contract.
- C. Electrical Contractor shall furnish and install the following for all mechanical equipment:
  - 1. Conduit and wiring for line voltage power to the equipment.
  - 2. Disconnect switches.
  - 3. Manual motor starters.
  - 4. Magnetic motor starters when part of a motor control center. See Division 26 and Drawings for further information.
- D. The work under this Section shall include furnishing and installing all controls on low and manual line voltage, including thermostats, auxiliary switches, relay wiring, interlock wiring; equipment control panels and transformers; and controls conduit unless specifically indicated as part of other work. Materials and methods of the control installation shall be in accordance with the Electrical Specifications.
- E. The Plumbing Contractor shall review all wiring connections which have any influence on this equipment or work and verify that these connections are correct before permitting any equipment to be operated which is furnished, installed, or modified under this Contract.

### **3.12 ELECTRICAL EQUIPMENT ROOM PRECAUTIONS**

- A. Ductwork or piping for mechanical systems shall not be installed in any switchgear room, transformer vault, telephone room or electric closet except as indicated. In any case, no ductwork or piping for mechanical systems shall be installed in the space equal to the width and depth of any electrical service equipment, switchboards, panel boards, or motor control centers and extending from the floor to a height of six feet above the equipment or to the structural ceiling, whichever is lower.



### 3.13 CUTTING AND REPAIRING

- A. No cutting shall be done except with approval. Cutting of structural members or footings is prohibited without the prior written consent of the structural engineer.
- B. Where cutting of paving, walls, ceilings, etc. is necessary for the installation of the plumbing work, it shall be done under the direction of this Section. Damage caused by this cutting shall be repaired to match original and adjacent surfaces without additional expense to the Owner. Cutting of new construction shall be by the installing Contractor of that construction as directed by this Contractor.

### 3.14 ACCESSIBILITY

- A. General: Valves, damper operators, filters, thermometers, pressure gauges, clean-out fittings, and indicating equipment or specialties requiring reading, adjusting, inspection, repairing, removal, or replacement shall be conveniently and accessibly located with reference to finished building. Thermometers and gauges installed to be easily read from floor.
- B. Panels: No unions, flanges, valves, dampers, controls, or equipment shall be placed in a location that will be inaccessible after the system is complete. Access panels or doors shall be provided where required whether or not shown on Drawings.
- C. Access Panels in Walls or Ceilings:
  - 1. Provide access panels in walls or ceilings. Milcor or approved equal, where indicated and where required to provide access to valves, dampers, and other appurtenances. Panels shall be style as selected by and as directed by wall or ceiling construction. Panel size shall be 24" x 24" unless indicated otherwise. Panels in acoustical barriers shall have same transmission loss as barrier. Panels in rated construction shall have same rating as construction in which installed.
  - 2. Door panels shall be no lighter than 14 gauge steel. Doors shall be equipped with concealed spring hinges and flush, screwdriver operated locks, except that key operated locks shall be used for all access doors in walls where door is within 6'-0" of floor. Locks for all key operated doors shall be keyed alike.
  - 3. Doors in ceramic tile surfaces shall be stainless steel or chrome plated. Doors in other finished surfaces shall be prime coated.
  - 4. Doors in fire rated grease exhaust duct shafts shall be fire rated and openable without the use of tools.
- D. Equipment Spaces: Provide aisles between equipment and ducts, electrical gear, etc. for complete service and inspection of equipment. Maintain minimum 6'-6" headroom in all access aisles. Maintain minimum 36" clearance at all service panels. Provide minimum clearances at electrical equipment per NEC. Provide 36" wide, 3/4" thick plywood covered catwalks in attics from access door to equipment.

### 3.15 TESTING

- A. Test all piping, ductwork, equipment, and systems as called for in the Specifications. Notify and inspection authorities prior to testing so that they may be witnessed. Protect all personnel and equipment during testing. Where Specifications do not cover specific points or methods, conform to manufacturer's specifications.

### 3.16 OPENINGS

- A. Locating and sizing of all openings for pipe, conduit and ductwork through walls, roof, etc. shall be done under this Division. Framing of openings shall be done by the respective trades in whose work the opening is made.

### 3.17 EQUIPMENT

- A. Keep all openings closed with plugs or caps to prevent entrance of foreign matter. Protect all piping, ductwork, fixtures, and equipment against dirt, water, chemical, or mechanical damage both before and after installation. Any equipment or apparatus damaged prior to final acceptance shall be restored to original condition or replaced at the discretion and at no additional cost to the Owner.

- B. Start-Up: Equipment shall be adjusted, lubricated, aligned, etc. prior to start-up. Inspect each piece of equipment prior to start-up. Start each piece of equipment in accordance with manufacturer's directions and warranty requirements.
- C. Finish: Protect all equipment and materials until in use. Any visible rust or corrosion shall be removed as directed prior to installation. All damaged factory painted finishes shall be cleaned and painted with manufacturer provided paint.

### **3.18 MANUFACTURER'S DIRECTIONS**

- A. Materials and equipment shall be installed in accordance with manufacturer's application and recommendations, requirements, and instructions, and in accordance with Contract Documents. Where manufacturer's instructions differ from those indicated or specified, they shall be brought to attention for resolution prior to equipment ordering and installation.
- B. Where requirements indicated in Contract Documents exceed manufacturer's requirements, Contract Documents shall govern.

### **3.19 FURRING AND PIPE SPACES**

- A. Spaces provided in the design of the building shall be utilized and the work shall be kept within the furring lines established on the Drawings.
- B. Layout: Maintain maximum head room under piping and equipment. Contractor to coordinate line locations with beams, windows, etc. to provide maximum clearance. From Drawings, ascertain heights of suspended ceilings and size of pipe shafts in which piping is concealed, and location and size of structural members in and adjacent to pipe shafts. Coordinate piping installation with ductwork, lighting, and other equipment. Ensure necessary clearances on trim plates at exposed penetrations of walls and floors. If sufficient room is not available above suspended ceiling or vertical shafts obtain clarification from before work is started.

### **3.20 CLEAN-UP**

- A. During the course of work under this Section, all rubbish, debris, surplus materials, tools, etc. resulting from this work shall be removed from work area and shall be disposed of off-site at the end of each working day. The Owner's premises shall be left clean and in a condition acceptable to the owner.
- B. Clean all work installed under this Contract to satisfaction of Owner and submit documentation that each system has been cleaned and results witnessed by the representative.
- C. All water distribution and piping systems, including those for cold water and hot water systems, shall be flushed thoroughly until piping is cleaned to satisfaction of the owner. See other Specification Sections for additional requirements.

### **3.21 STERILIZATION**

- A. Before being placed in service, all domestic water distribution systems, including those for cold water, drinking water, and the hot water system, shall be sterilized in accordance with the AWWA standard specification. The system shall be flushed with potable water until the sterilization residue is within the tolerable limits for domestic water.

### **3.22 ENGRAVED NAMEPLATES**

- A. Furnish and install plastic laminated engraved nameplates with 1/4" minimum lettering at panel mounted control devices, manual control stations, power disconnects, motor starters and pieces of equipment. Nameplates exposed to weather shall be engraved brass.

### **3.23 FINAL INSPECTION**

- A. The Contractor shall furnish the certificates of final inspection and approval from the inspection authorities having jurisdiction.

### **3.24 SITE VISITS BY ENGINEER**

- A. Engineer's responsibility is limited to normal construction support services only, consisting of office consultation, site visits, and reports at appropriate stages of construction such as rough-in, pre-final, and final.

- B. If the Engineer is requested for a site visit and the work performed to that point is not able to be reviewed, requiring an additional site visit, all costs incurred by the Engineer for additional site visits or office shall be paid for by that Contractor.

**END OF SECTION**

**SECTION 22 05 16**  
**EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Flexible pipe connectors.
- B. Expansion joints and compensators.
- C. Pipe loops, offsets, and swing joints.

**1.02 RELATED REQUIREMENTS**

- A. Section 22 10 05 - Plumbing Piping.

**1.03 REFERENCE STANDARDS**

- A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service 2022.
- B. EJMA (STDS) - EJMA Standards Tenth Edition.
- C. FM (AG) - FM Approval Guide Current Edition.
- D. UL (DIR) - Online Certifications Directory Current Edition.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data:
  - 1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot (meter) and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
  - 2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

**PART 2 PRODUCTS**

**2.01 FLEXIBLE PIPE CONNECTORS - COPPER PIPING**

- A. Manufacturers:
  - 1. Flex-Weld, Inc: [www.kelcoind.com/#sle](http://www.kelcoind.com/#sle).
  - 2. Mercer Rubber Company: [www.mercer-rubber.com/#sle](http://www.mercer-rubber.com/#sle).
  - 3. The Metraflex Company: [www.metraflex.com/#sle](http://www.metraflex.com/#sle).
- B. Pressure Rating: 125 psi up to 2 inch (862 kPa up to 50 mm, DN).
- C. Maximum Service Temperature: 450 degrees F (232 degrees C).
- D. End Connections: Flanged.
- E. Maximum offset: 3/4 inch (20 mm) on each side of installed center line.

**2.02 EXPANSION JOINTS - STAINLESS STEEL BELLOWS TYPE**

- A. Manufacturers:
  - 1. Flex-Weld, Inc; Keflex 7Q Series - Quadra-Side: [www.kelcoind.com/#sle](http://www.kelcoind.com/#sle).
  - 2. Mercer Rubber Company: [www.mercer-rubber.com/#sle](http://www.mercer-rubber.com/#sle).
- B. Pressure Rating: 125 psi and 400 degrees F (862 kPa and 204 degrees C).
- C. Maximum Compression: 1-3/4 inches (45 mm).

**2.03 EXPANSION JOINTS - TWO-PLY BRONZE BELLOWS TYPE**

- A. Manufacturers:
  - 1. Mercer Rubber Company: [www.mercer-rubber.com/#sle](http://www.mercer-rubber.com/#sle).
- B. Pressure Rating: 125 psi and 400 degrees F (862 kPa and 204 degrees C).
- C. Maximum Compression: 1-3/4 inches (45 mm).

D. Joint: Soldered.

## **2.04 EXPANSION JOINTS AND LOOPS - HOSE AND BRAID**

- A. Manufacturers:
  - 1. Flex-Weld, Inc; Keflex Ke-Loop: [www.kelcoind.com/#sle](http://www.kelcoind.com/#sle).
  - 2. The Metraflex Company; Metraloop: [www.metraflex.com/#sle](http://www.metraflex.com/#sle).
  - 3. Unisource Manufacturing, Inc; V-Loop: [www.unisource-mfg.com/#sle](http://www.unisource-mfg.com/#sle).
- B. Provide flexible loops with two flexible sections of hose and braid, two 90 degree elbows, and 180 degree return with support brackets and plugged drain port for steam service.
- C. Maximum Allowable Motion: 2 inch (50.8 mm) in the x, y, and z planes with no thrust loads to the building structure.
- D. Maximum Working Pressure: 150 psi (1030 kPa) at 800 degrees F (426.7 degrees C).
- E. Construction: Class 150, schedule 40, stainless steel hose and braid assembly with carbon steel fittings, including elbows and flanged end connections sized to match pipe segment.
  - 1. Selected Product to Accommodate:
    - a. Angular Rotation: 15 degrees.
    - b. Force developed by 1.5 times specified maximum allowable operating pressure.
  - 2. Provide necessary accessories including, but not limited to, swivel joints.

## **2.05 ACCESSORIES**

- A. Stainless Steel Pipe: ASTM A269/A269M, seamless type, Grade TP304.
- B. -----
- C. Note to Specifier: The stainless steel material option above is an accessory not relating to the material of the other products below.
- D. -----
- E. Pipe Alignment Guides:

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.
- C. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.
- D. Anchor pipe to building structure where indicated. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.
- E. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

**END OF SECTION**

**SECTION 22 05 17**  
**SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe sleeves.
- B. Pipe sleeve-seals.

**1.02 RELATED REQUIREMENTS**

- A. Section 22 05 23 - General-Duty Valves for Plumbing Piping.
- B. Section 22 05 53 - Identification for Plumbing Piping and Equipment: Piping identification.
- C. Section 22 07 16 - Plumbing Equipment Insulation.
- D. Section 22 07 19 - Plumbing Piping Insulation.

**1.03 REFERENCE STANDARDS**

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type) 2022a.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).
- C. FM (AG) - FM Approval Guide Current Edition.
- D. UL (DIR) - Online Certifications Directory Current Edition.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing work of the type specified this section.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

**1.06 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

**PART 2 PRODUCTS**

**2.01 PIPE SLEEVES**

- A. Vertical Piping:
  - 1. Sleeve Length: 1 inch (25 mm) above finished floor.
  - 2. Provide sealant for watertight joint.
  - 3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.
  - 4. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.
- B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Pipe Passing Through Below Grade Exterior Walls:
  - 1. Zinc coated or cast iron pipe.
  - 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- D. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:

1. Galvanized steel pipe or black iron pipe with asphalt coating.
2. Connect sleeve with floor plate except in mechanical rooms.
- E. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:
  1. Galvanized steel pipe or black iron pipe with asphalt coating.
  2. Connect sleeve with floor plate except in mechanical rooms.
- F. Clearances:
  1. Provide allowance for insulated piping.
  2. Wall, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external pipe diameter.
  3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.

## **2.02 PIPE-SLEEVE SEALS**

- A. Modular Mechanical Sleeve-Seal:
  1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
  2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
  3. Size and select seal component materials in accordance with service requirements.
  4. Glass-reinforced plastic pressure end plates.
- B. Sealing Compounds:
  1. Provide packing and sealing compound to fill pipe to sleeve thickness.
  2. Combined packing and sealing compounding to match partition fire-resistance hourly rating.
- C. Pipe Sleeve Material:
  1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.
  2. Masonry Structures: Sheet metal or fiber.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

### **3.02 INSTALLATION**

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- E. Manufactured Sleeve-Seal Systems:
  1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
  2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
  3. Locate piping in center of sleeve or penetration.
  4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
  5. Tighten bolting for a water-tight seal.
  6. Install in accordance with manufacturer's recommendations.
- F. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

**3.03 CLEANING**

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

**END OF SECTION**



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**SECTION 22 05 19**  
**METERS AND GAUGES FOR PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pressure gauges.
- B. Thermometers.
- C. Pressure-temperature test plugs.

**1.02 REFERENCE STANDARDS**

- A. AGA/ANSI B109 Set - INCLUDES ANSI B109.1, ANSI B109.2, ANSI B109.3, ANSI B109.4 2000.
- B. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks 2020, with Errata and Amendments (2022).
- C. ASME B40.100 - Pressure Gauges and Gauge Attachments 2022.
- D. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers 2014 (Reapproved 2020).
- E. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers 2014 (Reapproved 2021).
- F. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.
- G. NSF 372 - Drinking Water System Components - Lead Content 2022.
- H. UL (DIR) - Online Certifications Directory Current Edition.
- I. UL 393 - Indicating Pressure Gauges for Fire-Protection Service Current Edition, Including All Revisions.
- J. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Utility Service Metering: Coordinate and apply Utility Service Provider requirements in terms of meter type, size, physical location, pipe size, upstream/downstream pipe lengths required, and other installation details.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide red-marked product data sheets for each furnished item with associated components and accessories.

**PART 2 PRODUCTS**

**2.01 PRESSURE GAUGES**

- A. Bourdon Tube for Liquids and Gases:
  - 1. Dial Size and Cover: 4-1/2 inch (115 mm) diameter scale with polycarbonate window.
  - 2. Dial Text and Markings: Black color on white background with scaled kPa and psi units.
  - 3. Accuracy: ASME B40.100, adjustable commercial grade (D) with 5 percent of span.
  - 4. Process Connection: Lower-back, 1/4 inch (8 mm, DN) NPT male except where noted.
- B. Accessories:
  - 1. Gauge Cock: Carbon steel with tee or lever handle for maximum 150 psi (1034 kPa).

**2.02 THERMOMETERS**

- A. General:
  - 1. Product Compliance: ASTM E1.
  - 2. Lens: Clear glass, except where stated.
  - 3. Accuracy: One percent, when tested in accordance with ASTM E77, except where stated.

4. Scale: Black markings depicting single scale in degrees F where expected process value falls half-span of standard temperature range.
- B. Thermometers - Straight: 5 inch (127 mm) v-shape lead-free brass case with clear glass window scale, 2 inch (50.8 mm) NPT stem, 3-1/4 inch (82.5 mm) NPT thermowell, and red or blue non-toxic organic liquid filled glass tube.
- C. Thermometers - Dial Type:

### **2.03 PRESSURE-TEMPERATURE TEST PLUGS:**

- A. Size: 500 psi (34.5 bar) capacity; 1/2 inch (13 mm) MPT brass fitting with gasket, cap, and retaining strap for 1/8 inch (3 mm) pressure gauge or temperature probe.
- B. Wetted Materials per Temperature Range:
  1. Up to 200 degrees F (93 degrees C): Brass probe with neoprene core.
  2. 200 to 350 degrees F (93 to 176 degrees C): Brass probe with EPDM core.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verification of Conditions: Verify Utility Service Provider piping readiness to receive meter.
- B. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports, and test plugs.

### **3.02 INSTALLATION**

- A. Install pressure gauges as follows:
  1. At Pumps: Place single gauge before strainer, suction side and discharge side.
  2. Include gauge cock to isolate each gauge and extend nipples for insulation clearance.
  3. Adjust gauges to selected viewing angle, clean thoroughly, and calibrate to zero.
- B. Install thermometers as follows:
  1. Hot Water Heaters: Place upstream and downstream of heater. Add one on the inlet end when using steam as the water heating medium.
  2. Piping: Install thermometers in branch butt weld connection fitting or socket-weld thermowell. Enlarge pipes smaller than 2-1/2 inch (60 mm) to accommodate sockets. Ensure sockets are above insulation clearance.
- C. Locate PT (pressure-temperature) test plugs adjacent to control device sockets.

**END OF SECTION**

**SECTION 22 05 23**  
**GENERAL-DUTY VALVES FOR PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Ball valves.
- B. Butterfly valves.
- C. Check valves.
- D. Flow limiting valves.
- E. Gate valves.

**1.02 RELATED REQUIREMENTS**

- A. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- B. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- C. Section 22 07 16 - Plumbing Equipment Insulation.
- D. Section 22 07 19 - Plumbing Piping Insulation.
- E. Section 22 10 05 - Plumbing Piping.

**1.03 ABBREVIATIONS AND ACRONYMS**

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Non-rising stem.
- E. OS&Y: Outside screw and yoke.
- F. PTFE: Polytetrafluoroethylene.
- G. RS: Rising stem.
- H. TFE: Tetrafluoroethylene.
- I. WOG: Water, oil, and gas.

**1.04 REFERENCE STANDARDS**

- A. API STD 594 - Check Valves: Flanged, Lug, Wafer, and Butt-Welding 2022.
- B. ASME B1.20.1 - Pipe Threads, General Purpose, Inch 2013 (Reaffirmed 2018).
- C. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard 2020.
- D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2021.
- E. ASME B16.34 - Valves — Flanged, Threaded, and Welding End 2020.
- F. ASME B31.9 - Building Services Piping 2020.
- G. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators 2021.
- H. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings 2017.
- I. MSS SP-67 - Butterfly Valves 2022.
- J. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service 2010a.
- K. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves 2019.
- L. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010, with Errata .
- M. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.

N. NSF 372 - Drinking Water System Components - Lead Content 2022.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

#### **1.06 QUALITY ASSURANCE**

- A. Manufacturer:
  - 1. Obtain valves for each valve type from single manufacturer.
  - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Prepare valves for shipping as follows:
  - 1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
  - 2. Protect valve parts exposed to piped medium against rust and corrosion.
  - 3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
  - 4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
  - 5. Secure check valves in either the closed position or open position.
  - 6. Adjust butterfly valves to closed or partially closed position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection and protect flanges and specialties from dirt.
    - a. Provide temporary inlet and outlet caps.
    - b. Maintain caps in place until installation.
  - 2. Store valves in shipping containers and maintain in place until installation.
    - a. Store valves indoors in dry environment.
    - b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

### **PART 2 PRODUCTS**

#### **2.01 APPLICATIONS**

- A. See drawings for specific valve locations.
- B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).
- C. Provide the following valves for the applications if not indicated on drawings:
  - 1. Shutoff: Ball, butterfly, gate or plug.
  - 2. Swing Check (Pump Outlet):
- D. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.

#### **2.02 GENERAL REQUIREMENTS**

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
  - 1. Handwheel: Valves other than quarter-turn types.
  - 2. Hand Lever: Quarter-turn valves 6 inch (150 mm, DN) and smaller except plug valves.
- D. Insulated Piping Valves: With 2 inch (50 mm, DN) stem extensions and the following features:
  - 1. Gate Valves: Rising stem.
  - 2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
  - 3. Butterfly Valves: Extended neck.

- 4. Memory Stops: Fully adjustable after insulation is installed.
- E. Valve-End Connections:
  - 1. Threaded End Valves: ASME B1.20.1.
  - 2. Pipe Flanges and Flanged Fittings 1/2 inch (15 mm, DN) through 24 inch (600 mm, DN): ASME B16.5.
  - 3. Solder Joint Connections: ASME B16.18.
- F. General ASME Compliance:
- G. Potable Water Use:
  - 1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
  - 2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.
- H. Source Limitations: Obtain each valve type from a single manufacturer.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

#### **3.02 INSTALLATION**

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
- C. Install check valves where necessary to maintain direction of flow as follows:
  - 1. Lift Check: Install with stem plumb and vertical.
  - 2. Swing Check: Install horizontal maintaining hinge pin level.
- D. Provide chainwheels on operators for valves 4 inch (100 mm, DN) and larger where located 96 inch (2,400 mm, DN) or more above finished floor, terminating 60 inch (1,520 mm, DN) above finished floor.

**END OF SECTION**

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**SECTION 22 05 29**  
**HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Prefabricated trapeze-framed systems.
- B. Strut systems for pipe or equipment support.
- C. Beam clamps.
- D. Pipe hangers.
- E. Pipe rollers and roller supports.
- F. Pipe supports, guides, shields, and saddles.
- G. Seismic bracing hardware.
- H. Anchors and fasteners.

**1.02 RELATED REQUIREMENTS**

- A. Section 05 50 00 - Metal Fabrications.
- B. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

**1.03 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping 2022.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2022).
- F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.
- G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures 1999 (Reapproved 2022).
- 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 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 B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.
- L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a.
- M. FM (AG) - FM Approval Guide Current Edition.
- N. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).
- O. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.



- P. UL (DIR) - Online Certifications Directory Current Edition.
- Q. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

#### **1.05 QUALITY ASSURANCE**

- A. Comply with applicable building code.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 GENERAL REQUIREMENTS**

- A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.
- B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.
- C. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
- D. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
- E. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.
  - 1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
  - 2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.
- F. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

#### **2.02 PREFABRICATED TRAPEZE-FRAMED SYSTEMS**

- A. Prefabricated Trapeze-Framed Metal Strut Systems:
  - 1. Manufacturers:
    - a. Anvil International, LLC: [www.asc-es.com/#sle](http://www.asc-es.com/#sle).
    - b. Gripple, Inc; Fast Track - Standard: [www.gripple.com/#sle](http://www.gripple.com/#sle).
    - c. Unistrut, a brand of Atkore International, Inc: [www.unistrut.com/#sle](http://www.unistrut.com/#sle).
  - 2. Strut Channel or Bracket Material:
    - a. Indoor Dry Locations: Use zinc-plated steel or galvanized steel.
    - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
  - 3. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

#### **2.03 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT**

- A. Strut Channels:
  - 1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
  - 2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.
- B. Hanger Rods:
  - 1. Threaded zinc-plated steel unless otherwise indicated.

2. Minimum Size, Unless Otherwise Indicated or Required:
  - a. Equipment Supports: 1/2 inch (13 mm, DN) diameter.
  - b. Piping up to 1 inch (25 mm, DN): 1/4 inch (6 mm, DN) diameter.
  - c. Piping larger than 1 inch (25 mm, DN): 3/8 inch (10 mm, DN) diameter.
  - d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) in length.
- C. Channel Nuts:
  1. Manufacturers:
    - a. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
  2. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated on drawings.

#### **2.04 BEAM CLAMPS**

- A. Manufacturers:
  1. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
- B. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
- C. C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.
- D. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).
- E. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.
- F. Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with plain finish.
- G. FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plain finish.
- H. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- I. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

#### **2.05 PIPE HANGERS**

- A. Band Hangers, Adjustable:
  1. MSS SP-58 type 7 or 9, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
- B. J-Hangers, Adjustable:
  1. Manufacturers:
    - a. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
  2. MSS SP-58 type 5, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
- C. Swivel Ring Hangers, Adjustable:
  1. Manufacturers:
    - a. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
  2. MSS SP-58 type 10, epoxy-painted, zinc-colored.
  3. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
  4. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.
- D. Clevis Hangers, Adjustable:
  1. Manufacturers:
    - a. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
  2. Copper Tube: MSS SP-58 type 1, epoxy-plated copper.
  3. Felt-Lined: MSS SP-58 type 1, zinc-plated, silicone-free carbon steel.

4. Light-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.
5. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.

## **2.06 PIPE CLAMPS**

- A. Riser Clamps:
  1. Manufacturers:
    - a. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
  2. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
  3. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
  4. UL (DIR) listed: Pipe sizes 1/2 to 8 inch (15 to 200 mm, DN).
- B. Extension Split Pipe Clamp:
  1. Manufacturers:
    - a. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
  2. MSS SP-58 type 12, hinged split ring and yoke roller hanger with epoxy copper or plain finish.
  3. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
  4. Provide hanger rod and nuts of the same type and material for a given pipe run.
  5. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
- C. Insulation Coupling:
  1. Manufacturers:
    - a. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
  2. Two bolt-type clamps designed for installation under insulation.
  3. Material: Carbon steel with epoxy copper or zinc finish.

## **2.07 PIPE ROLLERS AND ROLLER SUPPORTS**

- A. Manufacturers:
  1. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
- B. MSS SP-58 type 43 based on required load, nonconductive and corrosion resistant.
- C. Material: Zinc plated ASTM A36/A36M carbon steel or ASTM A47/A47M malleable iron.

## **2.08 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES**

- A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.
- B. Stanchions:
  1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
  2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
- C. U-Bolts:
  1. MSS SP-58 type 24, carbon steel u-bolt for pipe support or anchoring.
- D. Pipe Shields for Insulated Piping:
  1. MSS SP-58 type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
  2. General Construction and Requirements:
    - a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
    - b. Shields Material: UV-resistant polypropylene with glass fill.
    - c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch (321 mm).
    - d. Service Temperature: Minus 40 to 178 degrees F (Minus 40 to 81 degrees C).

- e. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
- E. Pipe Supports:
  - 1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
  - 2. Liquid Temperatures Up to 122 degrees F (50 degrees C):
    - a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
    - b. Support From Below: MSS SP-58 types 35 through 38.
- F. Pipe Supports, Thermal Insulated:
  - 1. General Requirements:
    - a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
    - b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
    - c. Provide pipe supports for 1/2 to 30 inch (15 to 750 mm, DN) iron pipes.
    - d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.
  - 2. PVC Jacket:
    - a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.
    - b. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
    - c. Minimum Thickness: 60 mil, 0.06 inch (1.524 mm).

## **2.09 ANCHORS AND FASTENERS**

- A. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
- B. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
- C. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
- D. Hollow Masonry: Use toggle bolts.
- E. Hollow Stud Walls: Use toggle bolts.
- F. Steel: Use beam ceiling clamps, beam clamps, machine bolts, or welded threaded studs.
- G. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, plain, stainless steel, or zinc finish.
- H. Sheet Metal: Use sheet metal screws.
- I. Wood: Use wood screws.
- J. Plastic and lead anchors are not permitted.
- K. Powder-actuated fasteners are not permitted.
- L. Hammer-driven anchors and fasteners are not permitted.
- M. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
  - 1. Channel Material: Use galvanized steel.
  - 2. Manufacturer: Same as manufacturer of metal strut channel framing system.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- G. Equipment Support and Attachment:
  - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.

**END OF SECTION**

**SECTION 22 05 53**  
**IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

**PART 2 PRODUCTS**

**1.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE**

A. Pipe Markers: 3/4 inch (20 mm) diameter and higher.

**1.02 PIPE MARKERS**

**END OF SECTION**

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**SECTION 22 07 19  
PLUMBING PIPING INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Cellular glass insulation.
- B. Glass fiber insulation.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

**1.03 REFERENCE STANDARDS**

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.
- B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement 2007 (Reapproved 2019).
- C. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement 2007 (Reapproved 2019).
- D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2021.
- E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2022a.
- F. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).
- G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2018).
- H. ASTM C1775 - Standard Specification for Laminate Protective Jacket and Tape for Use Over Thermal Insulation for Outdoor Applications 2022.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.
- J. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a.
- K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

**1.06 FIELD CONDITIONS**

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

**PART 2 PRODUCTS**

**2.01 REGULATORY REQUIREMENTS**

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.



## 2.02 GLASS FIBER INSULATION

- A. Manufacturers:
  - 1. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: [www.knaufinsulation.com/#sle](http://www.knaufinsulation.com/#sle).
  - 2. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
  - 3. Owens Corning Corporation; VaporWick Pipe Insulation: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
  - 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
  - 2. Maximum Service Temperature: 850 degrees F (454 degrees C).
  - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
  - 1. K (Ksi) Value: ASTM C177, 0.23 at 75 degrees F (0.034 at 24 degrees C).
  - 2. Maximum Service Temperature: 220 degrees F (104 degrees C).
  - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- D. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm (0.029 ng/(Pa s m)).
- E. Vapor Barrier Lap Adhesive: Compatible with insulation.
- F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- D. Glass fiber insulated pipes conveying fluids below ambient temperature:
  - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- E. Glass fiber insulated pipes conveying fluids above ambient temperature:
  - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
  - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- F. Inserts and Shields:
  - 1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
  - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  - 3. Insert Location: Between support shield and piping and under the finish jacket.
- G. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 84 00.

### 3.03 SCHEDULES

- A. Plumbing Systems:
  - 1. Domestic Hot Water Supply:
    - a. Glass Fiber Insulation:
      - 1) Pipe Size Range: <1" to <1-1/2".
      - 2) InsulationThickness: 1".
      - 3) Pipe Size Range: 1-1/2" to 8"
      - 4) InsulationThickness: 1-1/2".
  - 2. Domestic Cold Water:
  - 3. Roof Drain Bodies:
  - 4. Roof Drainage Within 10 Feet (3 Meters) of the Exterior:

**END OF SECTION**

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**SECTION 22 10 05  
PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Sanitary waste piping, buried within 5 feet (1500 mm) of building.
- B. Sanitary waste piping, above grade.
- C. Domestic water piping, buried within 5 feet (1500 mm) of building.
- D. Domestic water piping, above grade.
- E. Storm drainage piping, buried within 5 feet (1500 mm) of building.
- F. Storm drainage piping, above grade.
- G. Pipe flanges, unions, and couplings.
- H. Pipe hangers and supports.
- I. Pipe sleeve-seal systems.
- J. Ball valves.
- K. Balancing valves.
- L. Flow-balancing valves.
- M. Pressure reducing valves.
- N. Pressure relief valves.
- O. Control and service valves.
- P. Pressure-temperature valves.
- Q. Strainers.

**1.02 RELATED REQUIREMENTS**

- A. Section 22 05 16 - Expansion Fittings and Loops for Plumbing Piping.
- B. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.
- C. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- D. Section 22 05 53 - Identification for Plumbing Piping and Equipment.
- E. Section 22 07 19 - Plumbing Piping Insulation.

**1.03 REFERENCE STANDARDS**

- A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems 2015 (Reaffirmed 2020).
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2021.
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2021.
- D. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings 2021.
- E. ASTM B32 - Standard Specification for Solder Metal 2020.
- F. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes 2020.
- G. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.
- H. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.
- I. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2020a.
- J. ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings 2020.

- K. ASTM C1540 - Standard Specification for Heavy-Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings 2020.
- L. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings 2022.
- M. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems 2020.
- N. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings 2020.
- O. ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping 2020.
- P. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2021.
- Q. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets 2020.
- R. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2021.
- S. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.
- T. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing 2023.
- U. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-Linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing 2023.
- V. AWWA C651 - Disinfecting Water Mains 2014, with Addendum (2020).
- W. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2021.
- X. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2020.
- Y. FM 1680 - Approval Standard for Couplings Used in Hubless Cast Iron Systems for Drain, Waste or Vent, Sewer, Rainwater or Storm Drain Systems Above and Below Ground, Industrial/Commercial and Residential 1989.
- Z. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).
- AA. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.
- BB. NSF 372 - Drinking Water System Components - Lead Content 2022.
- CC. PPI TR-4 - PPI HSB Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe 2021.
- DD. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.

- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

## **1.06 FIELD CONDITIONS**

- A. Do not install underground piping when bedding is wet or frozen.

## **PART 2 PRODUCTS**

### **2.01 GENERAL REQUIREMENTS**

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

### **2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING**

- A. Cast Iron Pipe: CISPI 301, hubless.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
- B. ABS Pipe: ASTM F628.
  - 1. Fittings: ABS.
  - 2. Joints: Solvent welded with ASTM D2235 cement.
- C. PVC Pipe: ASTM D2665 or ASTM D3034.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

### **2.03 SANITARY WASTE PIPING, ABOVE GRADE**

- A. Cast Iron Pipe: ASTM A74, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. ABS Pipe: ASTM F628.
  - 1. Fittings: ABS.
  - 2. Joints: Solvent welded with ASTM D2235 cement.
- D. PVC Pipe: ASTM D2729.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

### **2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING**

- A. Copper Pipe: ASTM B42, hard drawn.
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
  - 2. Joints: AWS A5.8M/A5.8, BCuP copper/silver braze.

### **2.05 DOMESTIC WATER PIPING, ABOVE GRADE**

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, alloy Sn95 solder.
  - 3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.
    - a. Manufacturers:
      - 1) Apollo Valves; [\_\_\_\_\_]: [www.apollovalves.com/#sle](http://www.apollovalves.com/#sle).
      - 2) Grinnell Products; [\_\_\_\_\_]: [www.grinnell.com/#sle](http://www.grinnell.com/#sle).
      - 3) Viega LLC; [\_\_\_\_\_]: [www.viega.us/#sle](http://www.viega.us/#sle).
- B. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.

1. Manufacturers:
  - a. Uponor, Inc; [\_\_\_\_]: [www.uponorengineering.com/#sle](http://www.uponorengineering.com/#sle).
  - b. Viega LLC; [\_\_\_\_]: [www.viega.us/#sle](http://www.viega.us/#sle).
  - c. Zurn Industries, LLC; [\_\_\_\_]: [www.zurn.com/#sle](http://www.zurn.com/#sle).
2. PPI TR-4 Pressure Design Basis:
  - a. 160 psig (1102 kPa) at maximum 73 degrees F (23 degrees C).
3. Fittings: Brass and engineered polymer (EP) ASTM F1960.
4. Joints: ASTM F1960 cold-expansion fittings.

## **2.06 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING**

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
  1. Fittings: Cast iron.
  2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
- B. ABS Pipe: ASTM D2680.
  1. Fittings: ABS.
  2. Joints: Solvent welded with ASTM D2235 cement.
- C. PVC Pipe: ASTM D2665 or ASTM D3034.
  1. Fittings: PVC.
  2. Joints: Solvent welded, with ASTM D2564 solvent cement.

## **2.07 STORM DRAINAGE PIPING, ABOVE GRADE**

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.
  1. Fittings: Cast iron.
  2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.
- B. ABS Pipe: ASTM D2680.
  1. Fittings: ABS.
  2. Joints: Solvent welded with ASTM D2235 cement.
- C. PVC Pipe: ASTM D2665.
  1. Fittings: PVC.
  2. Joints: Solvent welded, with ASTM D2564 solvent cement.

## **2.08 PIPE FLANGES, UNIONS, AND COUPLINGS**

- A. Unions for Pipe Sizes 3 inch (80 mm, DN) and Under:
  1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. No-Hub Couplings:
  1. Testing: In accordance with ASTM C1277 and CISPI 310.
  2. Gasket Material: Neoprene complying with ASTM C564.
  3. Band Material: Stainless steel.
  4. Eyelet Material: Stainless steel.
- C. Shielded, Heavy Duty No-Hub Couplings:
  1. Testing: In accordance with ASTM C1540 and FM 1680.
  2. Gasket Material: Neoprene complying with ASTM C564.
  3. Band Material: Stainless steel.
  4. Eyelet Material: Stainless steel.

## **2.09 PIPE HANGERS AND SUPPORTS**

- A. See Section 22 05 29 for additional requirements.
- B. Provide hangers and supports that comply with MSS SP-58.
  1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  3. Trapeze Hangers: Welded steel channel frames attached to structure.
  4. Vertical Pipe Support: Steel riser clamp.

C. Plumbing Piping - Drain, Waste, and Vent:

**2.10 PRESSURE RELIEF VALVES**

- A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

**2.11 STRAINERS**

- A. Size 1/2 inch (15 mm, DN) to 3 inch (80 mm, DN):
1. Class 150, threaded forged bronze Y-pattern body, stainless steel perforated mesh screen with cap, and rated for 150 psi (1,034 kPa), 250 deg F (121.1 deg C) WOG service.
- B. Size 2 inch (50 mm, DN) and Smaller:
1. Threaded brass body for 175 psi (1200 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
  2. Class 150, threaded bronze body 300 psi (2070 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
- C. Size 1-1/2 inch (40 mm, DN) to 4 inch (100 mm, DN):
1. Class 125, flanged iron body, Y pattern with 1/16 inch (1.6 mm) stainless steel perforated screen.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that excavations are to required grade, dry, and not over-excavated.

**3.02 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

**3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 22 05 16.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- J. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
- K. Install bell and spigot pipe with bell end upstream.
- L. Install valves with stems upright or horizontal, not inverted. See Section 22 05 23.
- M. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- N. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- O. Sleeve pipes passing through partitions, walls, and floors.



### **3.04 FIELD TESTS AND INSPECTIONS**

- A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.
- B. Domestic Water Systems:
  - 1. Perform hydrostatic testing for leakage prior to system disinfection.
  - 2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
  - 3. General:
    - a. Fill the system with water and raise static head to 10 psi (345 kPa) above service pressure. Minimum static head of 50 to 150 psi (345 to 1,034 kPa). As an exception, certain codes allow a maximum static pressure of 80 psi (551.6 kPa).
- C. Test Results: Document and certify successful results, otherwise repair, document, and retest.

### **3.05 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM**

- A. Prior to starting work, verify system is complete, flushed, and clean.
- B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

**END OF SECTION**

**SECTION 22 10 06  
PLUMBING PIPING SPECIALTIES**

**PART 1 GENERAL**

**1.01 REFERENCE STANDARDS**

- A. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.
- B. NSF 372 - Drinking Water System Components - Lead Content 2022.

**1.02 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

**1.03 DELIVERY, STORAGE, AND HANDLING**

- A. Accept specialties on site in original factory packaging. Inspect for damage.

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- F. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks, washing machine outlets, or [\_\_\_\_\_].
- G. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch (20 mm) minimum, and minimum 18 inches (450 mm) long.

**END OF SECTION**

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SECTION 22 20 00 - LABORATORY PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Intent of Laboratory Plumbing Specification Section:

1. The intent of this section is to provide information which is supplemental to all other divisions and sections of the specifications, and in particular to Division 22 Plumbing work, which shall be specifically related to the plumbing construction within the areas defined under the Laboratory scope of work. It is not intended to make any deletions, either explicitly or implicitly, to any of the other division or section requirements, and these sections do not relieve the Contractor from complying in all respects with other divisions and sections of the specifications. The other divisions and sections shall be considered to be an integral part of the Laboratory Plumbing work and shall be modified only as defined herein. Any questions the Contractor has with respect to the intent of the Laboratory Plumbing work sections should be addressed during the bidding period. Clarifications will be provided upon written request.

B. Section Includes:

1. Provide complete plumbing systems from point of rough-in and final connections as described in these specifications and as shown on the Contract Drawings. Plumbing installations shall include all piping, valves, connectors and miscellaneous equipment to provide complete operable systems, in accordance with the best practices of the trade.
2. Except as modified by this section, all products, equipment, installation procedures, and general conditions contained within Division 22 Plumbing sections of these specifications applies to work specified in this section.
3. Work under this section includes, but is not limited to, installation of branch supply piping from main piping systems to points of termination within the laboratories, as well as laboratory waste and vent piping from between floor and ceiling.
4. Work NOT included under this section is as follows:
  - a. Laboratory waste piping below point of connection at the floor slab
  - b. Laboratory vent piping beyond point of connection above ceiling
  - c. Building distribution main piping systems
  - d. Fire sprinkler systems
  - e. Steam and condensate piping systems
5. Refer to Divisions 21, 22, and 23 for above work.

C. Related Requirements:

1. General and Supplementary Conditions and Division 1
2. Section 11 53 10 – Laboratory Casework and Other Furnishings
3. Division 22 – Plumbing
4. Division 23 – Heating Ventilating and Air Conditioning
5. Division 26 – Electrical

## 1.2 REFERENCES

- A. In addition to complying with all applicable trade and building codes and regulations, comply with applicable portions of the National Sanitation Foundation (NSF) standards.

## 1.3 DEFINITIONS

- A. Above Finished Floor: Inside building within a zone usually considered at  $\pm 6"$  above floor finish.
- B. Above Finished Ceiling: Inside building within a zone usually considered at  $\pm 6"$  above ceiling finish.
- C. Below Slab: Located in ceiling space of floor below, buried in ground, or embedded in concrete slab on ground.
- D. Concealed: Inside building, above grade and located within walls, furred spaces, service cores, pipe drop enclosures, above suspended ceilings, etc. In general any item not visible or directly accessible.
- E. Connect: Complete hookup of item with required services, including all adapters and fittings.
- F. Exposed: Either visible or subject to mechanical or weather damage, indoors or outdoors, including areas such as mechanical and storage rooms. In general any item that is directly accessible without removing panels, walls, ceiling or other parts of structure commonly used as reference to surface mounted piping, etc.
- G. Point of Connection: Point within a piped system at which responsibility of this section either begins or ends. i.e. laboratory waste begins at fixture outlet and ends at Point of Connection (P.O.C.)  $\pm 6"$  above floor finish. From there to be continued on Plumbing Drawings, and remainder of Division 22 specifications.

## 1.4 CLOSING IN UNINSPECTED WORK

- A. Do not cover or enclose work prior to testing, inspection, and approval. All work covered or enclosed prior to approval and acceptance shall be re-opened. All finishes shall be restored.

## 1.5 SUBMITTALS

- A. Submit as specified herein and under provisions of Division 1 "Submittal Requirements".
- B. Submittal shall be complete with all product data specified herein and organized by specification reference section into a single electronic file. All submitted product data shall be referenced to the applicable paragraph number contained within this specification section.
- C. Manufacturer's Data: Submit complete materials list, including catalog data, of all materials, equipment, and products for work in this section.
- D. Shop Drawings: Submit coordinated shop drawings depicting the work specified herein for actual fabrication and installation. Work shall be coordinated with other trades and building structural and architectural elements. Shop drawings shall include plans, elevations, and sections as required depicting the intended installation and final product. Drawings shall be electronically prepared in AutoCAD or similar software and submitted in a complete package with minimum  $\frac{1}{4}$  inch = 1 ft scale format and maximum sheet size of Architectural "E" (30" x 42").

## 1.6 RECORD DRAWINGS

- A. The Contractor shall maintain an up-to-date set of "red-line" prints, marked to indicate progress of the Project and all as-built conditions. Prints shall be updated on a daily basis, and shall be available for review at all times on the job site.
- B. Record Drawings shall indicate locations of all equipment and pipe rerouting, as well as any changes in locations or positions of equipment.

- C. Comply with Division 1 "Project Closeout" for Record Drawings requirements.

## 1.7 SUBSTITUTIONS

- A. Approved Substitution/Approved Equal: In addition to the items required in Division 1, all substitution requests shall include item-by-item comparison of the proposed substitution to this project specification. A copy of the project specification shall be submitted, with each item and subsection of the project specification marked as "Comply" or "Not Comply." In any cases where "Not Comply" is indicated, an explanation of the relative advantages of the proposed design shall be provided.
- B. Substitution shall not affect dimensions shown on Drawings.
- C. The Contractor shall pay for changes to the building design, including engineering design, detailing, utility and service requirements, and construction costs caused by the requested substitution.
- D. Substitutions shall have no adverse effect on other trades, the construction schedule, or specified warranty requirements.
- E. Maintenance and service parts shall be locally available for the proposed substitution.

## PART 2 - PRODUCTS

### 2.1 PIPING AND FITTINGS

- A. Domestic and Industrial Cold, Hot, and Tepid Water:
  - 1. Provide pipe and fittings as specified in Section 22 63 16.
  - 2. Flexible Connectors: Provide 150 psi WOG working pressure rating, single braid, and stainless steel hose with chrome plated brass threaded end connections. Manufacturers: US Hose Corp., Hyspan, or approved equal.
  - 3. Flexible Tubing: Provide ASTM B 88 Type L, soft, annealed, seamless copper tubing.
  - 4. Water Hammer Arrestors: Provide ASSE 1010, ANSI A112.26.1, or PDI-WH 201 certified copper tube with piston arrestor constructed of Type K or L hard drawn copper body, brass piston with lubricated dual O-ring seals, and threaded wrought copper or brass MIP connector. Manufacturers: PPP Inc., Sioux Chief, or approved equal.
- B. Laboratory Waste and Vent:
  - 1. Provide pipe and fittings as specified in Section 22 63 16.
    - a. Joints:
      - 1) Polypropylene (PP), fusion weld, per manufacturer's instructions. Installed behind walls, partitions, inaccessible ceiling spaces etc., unless otherwise noted.
      - 2) Polypropylene (PP), mechanical joint, per manufacturer's instructions. Installed in areas exposed to view, accessible ceiling spaces, fixture P-trap connections (both ends), and areas subject to ease of retrofit of the system.
      - 3) Mechanical joints within sink cabinets and other areas exposed to view shall be threaded or grooved style piping joints. Compression bands shall not be used in these locations.
  - 2. Provide chrome-plated brass waste piping for tailpiece, P-trap, and trap arm at exposed-to-view locations for installations of emergency eyewash Laboratory fixtures and wall-hung hand wash sinks.

## 2.2 VALVES

### A. Domestic and Industrial Cold, Hot, and Tepid Water:

#### 1. Fixture Supply Stop Valves:

- a. Provide angle pattern, ¼-turn ball, loose key with lockshield supply stop valve. Brass body and stem chrome plated, metal oval key handle. Provide chrome finished metal escutcheon, 250 psi/250°F rating, 1/2-inch FIP inlet x 3/8-inch O.D. outlet. Manufacturers: BrassCraft, Dahl, or approved equal.

#### 2. Shutoff Valves:

- a. Provide ball valves as specified in Section 22 05 23.

#### 3. Check Valves:

- a. Provide Y-pattern check valves as specified in Section 22 05 23.

#### 4. Vacuum Breakers: Provide vacuum breakers on potable water services as accepted by local building Authority. Manufacturers: Watts, Sloan, or approved equal.

#### 5. Back Flow Preventers: Provide reduced-pressure-principle backflow preventers on potable water services supplying laboratory equipment, as accepted by local building Authority, and as specified in Section 22 11 19.

#### 6. Pressure regulators: Provide adjustable water pressure regulators service fitting connection size and as specified in Section 22 11 19.

## 2.3 SEDIMENT TRAPS

- ### A. Acid-resisting inside and outside, top access, fixture trap type, for on-floor installation, with 1-1/2 or 2 inch inlet and outlet to match scheduled sink waste size. Provide NPT threaded connections, gasketed cover and removable perforated stainless steel basket and screen. Manufacturer: Josam 61030 Series aluminum solids interceptor model #61031-1/2 or #61032, or approved equal.

## 2.4 PROTECTIVE PIPE COVER (AT EXPOSED P-TRAP ARMS)

- ### A. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers. All products specified in this section shall be provided by a single manufacturer.

1. Truebro, Inc., <http://www.ipscorp.com/truebro> .
2. Approved equal.

### B. Basis of Design: Truebro LAV GUARD undersink protective pipe cover.

### C. Description; Flexible, molded, antimicrobial, closed cell vinyl pipe cover and fittings for P-trap, angle valve, tailpiece, extension arm, supply tube, etc. components below sink.

### D. Material Characteristics:

1. Wall thickness: 1/8 inch (3 mm).
2. Durometer: 60 – 70 Shore A.
3. Finish: Smooth high gloss.
4. Color: White
5. UV Protection: Will not fade or discolor
6. Flame Characteristics (ASTM D 635): 0 sec. (ATB), 0 mm (AEB)
7. Thermal conductivity (K value): 1.17 plus dead air space

E. Features:

1. Fasteners: Reusable snap clips
2. Protective wrap shall install without disassembling plumbing
3. Latching covers to access angle stops
4. Removable cleanout nut for servicing

2.5 INSULATION

- A. Insulate laboratory piping as specified in Section 22 07 13 for the respective systems.

2.6 PIPING HANGERS, SUPPORTS AND GUIDE

- A. Provide hangers and supports as specified in Section 22 11 16.

2.7 PIPING AND EQUIPMENT IDENTIFICATION

- A. Provide identification for plumbing piping and equipment as specified in Section 22 05 53.

PART 3 - EXECUTION

3.1 CONNECTION

- A. Connect laboratory piping to P.O.C. valves shown on Plumbing drawings and to laboratory services. Provide threaded couplings at final connection to service fittings and valve stops.
- B. Laboratory Waste and Vent:
1. Laboratory Waste: Connect laboratory fixture/outlet waste to P.O.C. of laboratory waste. Extend piping from tail piece connector with trap and trap arm,
  2. Laboratory Vent: Connect fixture trap arm to P.O.C. of laboratory vent.

3.2 INSTALLATION

- A. Domestic and Industrial Cold, Hot, and Tepid Water:
1. Extend piping from P.O.C. to services as indicated on LP-series drawings. Provide threaded couplings at final connection to service fittings and valve stops.
  2. Install approved pressure regulators on laboratory equipment connections when required by equipment manufacturer. Set delivery pressure within equipment manufactures' specifications.
  3. Install water hammer arrestors on water piping that serves quick closing or solenoid operated valves for equipment or laboratory services. Water hammer arrestors shall be installed upstream of these valves in accordance with manufacturer's recommendations.
  4. Fixture Connection: Install supply stop valve for each service to fixture as indicated on LP-series drawings. Install flexible connector or flexible tubing from valve to fixture supply water connections.
  5. Extend tepid domestic water piping from P.O.C. to drench hoses and safety shower/eyewash units as indicated on LP-series drawings.
  6. Refer to corresponding sections of Division 22 for system cleaning and disinfecting requirements.

3.3 TESTS

- A. Contractor shall thoroughly test all Work prior to operation in the presence of Owner's Representative. Any Work showing faults under test shall be replaced. Contractor shall maintain



an accurate written record of all tests and test results, and shall submit three copies of all final tests to the Owner's Representative.

- B. Refer to Division 22 specifications for system test requirements. If not specified elsewhere, minimum requirements shall be as follows:
  - 1. Domestic Cold, Hot, and Tepid Water: Test under a cold water hydrostatic pressure of 150 psig for a period of four (4) hours and carefully check for leaks. Repair all leaks and re-test system until proven watertight with no loss of pressure or leakage allowed.
  - 2. Leak Tests:
    - a. Nitrogen Pressure Test: The line pressure shall be brought up to test pressure. Perform bubble test of all joints with a soap solution. Repair all leaks and re-test system until proven gas-tight with no loss of pressure or leakage allowed.

END OF SECTION

**SECTION 22 30 00  
PLUMBING EQUIPMENT**

**PART 1 GENERAL**

**1.01 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data:
  - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
  - 2. Indicate pump type, capacity, power requirements.
  - 3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
  - 4. Provide electrical characteristics and connection requirements.
- C. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.02 DELIVERY, STORAGE, AND HANDLING**

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

**1.03 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for domestic water heaters.

**PART 2 PRODUCTS**

**2.01 ELECTRICAL WORK**

- A. Electrical characteristics to be as specified or indicated.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.

**END OF SECTION**

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**SECTION 22 40 00  
PLUMBING FIXTURES**

**PART 1 GENERAL**

**1.01 REFERENCE STANDARDS**

- A. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.
- B. NSF 372 - Drinking Water System Components - Lead Content 2022.

**1.02 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

**1.03 DELIVERY, STORAGE, AND HANDLING**

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

**1.04 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

**2.02 REGULATORY REQUIREMENTS**

- A. Comply with applicable codes for installation of plumbing systems.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

**3.02 PREPARATION**

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

**3.03 INSTALLATION**

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome-plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.

**3.04 INTERFACE WITH WORK OF OTHER SECTIONS**

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

**3.05 ADJUSTING**

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

**3.06 CLEANING**

- A. Clean plumbing fixtures and equipment.

**3.07 PROTECTION**

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

**END OF SECTION**

**SECTION 23 00 00  
GENERAL REQUIREMENTS FOR HVAC (COLEBREIT MASTER)**

**PART 1 – GENERAL**

**1.01 APPLICABLE REQUIREMENTS**

- A. All work to be furnished and installed under this section shall comply with Division 01 – General Requirements when available. If not available, the Contractor shall meet the requirements of these specifications.
- B. Where the Owner-Contractor Agreement contradicts this division, the more stringent shall apply.

**1.02 RELATED REQUIREMENTS**

- A. Codes to include latest adopted editions, including current amendments, supplements, and local jurisdiction requirements in effect as of the date of the Contract Documents, including state/local building code, mechanical code, plumbing code, electrical code, fire code, and energy code.

**1.03 GENERAL SCOPE**

- A. Work included in 23 00 00 applies to Division 23 work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of mechanical systems for proposed project.
- B. Contract Documents include, but are not limited to, Specifications, Drawings, Addenda, Owner/Engineer Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.
- C. In the event there is a discrepancy between the drawings, specifications and current code, the more stringent shall apply.
- D. Examine the Drawings, specifications and other Contract Documents relating to the Work and the work of all trades and become fully informed as to the extent and character of work required. Coordinate all work with that of others to ensure proper and complete installation of all materials, equipment and supports.
- E. Intent:
  - 1. The intent of the Contract Documents is for the Contractor to include all work necessary for the complete systems, tested and ready for operation (hereinafter "Design Intent").
  - 2. Provide all items not specifically shown on the drawings, called for in the specifications or related Contract Documents, but required to conform to the labor, material and equipment to achieve the Design Intent.
  - 3. Provide all scaffolding, access provisions, tools, appliances, consumables, debris removal/disposal, supervision and labor, including required start-up, check-out and training to provide complete and fully operable systems in full compliance with the Contract Documents.
  - 4. Before submitting a bid and prior to the start of work, Contractor shall examine all conditions relating to the Work, including that associated with the work of other trades upon which Contractor's work may rely or otherwise depend, to achieve the Design Intent, in accordance with the best trade practices, workmanship and highest quality product installation, taking into account the sequence of the work, delivery, storage and hoisting requirements, requirements for access, testing and temporary services and all other site limitations and project complexities. Report to the Architect/Engineer any conditions which might prevent installation of materials and/or equipment in the manner intended by the Contract Documents or contrary to applicable codes, standards or regulations.
  - 5. By submitting a bid, the Contractor represents that it has made a thorough examination of the site, of the work, including that associated with the work of other trades, all existing conditions and limitations, and that it has examined the Contract Documents in complete detail and has determined beyond doubt that the drawings, specifications, and existing conditions are sufficient, adequate and satisfactory for the construction of the work under the Contract.

6. No consideration or allowance will be granted for any alleged misunderstanding of materials, equipment or components to be furnished or work to be done; it being agreed that tender of proposal carries with it agreement to items, terms and conditions required by the Contract Documents.
  7. Where minor adjustments of the work are necessary for purposes of fabrication or installation of items, or resolution of conflicts between items within the intent of the Contract Documents, the Contractor shall make such adjustments with no added compensation. Where such adjustments affect functional or aesthetic design of the work, they shall first be submitted to the Architect for review and approval.
- F. Site Visit:
1. Contractor shall visit the site and verify the exact conditions relating to the work and obtain such information as may be necessary to present a complete and comprehensive bid. No allowance will be made for any extra expense due to Contractor's failure to make such a visit and reasonably verify all actual/existing conditions. In the event of a conflict between existing conditions and the requirements of the Contract Documents, perform the necessary work to conform to Design Intent. The Owner or his representative will be the sole individual to interpret the intent of the Drawings in the event of a conflict between (1) existing conditions and those shown on the drawings, or (2) quality of existing material and quality of material indicated on the drawings or in the specifications. Wherever a conflict such as this occurs, the higher standard shall prevail.
- G. Conditions:
1. Conform to all Bidding Requirements and General Conditions
  2. The Contractor is obligated to comply with the above in addition to the requirements of this Section.
  3. Modifications by this Section do not nullify any other portions of the above-referenced conditions.
- H. Make complete system installation, connecting to all equipment shown on the plans, or called for in the specifications. Contractor to provide any additional components not shown on plans to obtain design criteria as required for a complete system and by the balancing contractor.
- I. Drawings:
1. Drawings do not attempt to show all aspects of building construction, which will affect the installation of the systems. The drawings are diagrammatic and do not intend to show all offsets and fittings that may be required for a complete installation. Locations of equipment, pipes, valves, traps, ductwork, etc. shown on the drawings, shall be followed as closely as conditions will permit. Review all project drawings, including, but not limited to, architectural, structural, plumbing and electrical drawings; and coordinate with all trades involved so there is no conflict with work of other trades and so Owner secures best arrangement of work consistent with use of space.
  2. Verify exact distances between points shown on drawings by actual measurement at site, as no extra cost will be allowed for differences between actual measurements and scaled measurements on drawings.
  3. Changes in design, configuration, or location of equipment, piping, or ductwork, advisable in the opinion of Contractor, shall be submitted to Architect/Engineer for approval before proceeding with work, with written assurance from other trades that such changes will not interfere with their installation, nor cause any extra cost on their part. Such changes shall be made at no additional cost to Owner.
  4. Check location of all work of all trades and avoid interferences. Conflicts shall be reported to Architect/Engineer for decision and direction. Special attention is called to the following items:
    - a. Exact location of outlets shown on architectural details.
    - b. Location of suspended ceilings.

#### **1.04 SPECIAL REQUIREMENTS**

- A. When applicable, Contractor acknowledges the ongoing operations of the Owner at or in close proximity to the Project and agrees to coordinate the timing of the Work with the Owner's

ongoing operations; perform the Work in a manner that minimizes or eliminates and adverse impact upon the Owner's ongoing operations; confine operations at the site to areas approved by Owner, permitted by law, permits and the Contract Documents; comply with the Owner's standard security, health and safety policies and procedures; not unreasonably encumber the site with any materials or equipment; and not place signs or advertising on or about the site without prior approval of Owner.

- B. Where applicable, all seismic construction, restraints, bracing, mounts and hanging systems shall be in full compliance with the requirements of all Authorities Having Jurisdiction (AHJ's), pre-approval, certification and engineering (including certified engineering calculations and stamps). Contractor shall be solely responsible for obtaining and complying with all requirements of the AHJ.

#### **1.05 DEFINITIONS AND ABBREVIATIONS**

- A. Finished Spaces: Spaces other than mechanical, plumbing and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical, electrical and plumbing 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 spaces above hard or lay-in type 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 word "provide," means "furnish and install."
- G. The word "approved," means acceptance by the Architect or Engineer
- H. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the drawings, or other paragraphs or schedules in the specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.
- I. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted," mean directed by the Architect/Engineer, requested by the Architect/Engineer, and similar phrases.

#### **1.06 REFERENCE STANDARDS AND GUIDELINES**

- A. Include but are not limited to the latest adopted editions from:
  - 1. AABC: Associated Air Balance Council
  - 2. ADA: Americans with Disabilities Act
  - 3. AHRI: Air-Conditioning Heating & Refrigeration Institute
  - 4. AMCA: Air Moving and Conditioning Association
  - 5. ANSI: American National Standards Institute
  - 6. ARI: Air Conditioning and Refrigeration Institute
  - 7. ASHRAE: American Society of Heating, Refrigerating, and Air Conditioning Engineers
  - 8. ASME: American Society of Mechanical Engineers
  - 9. ASPE: American Society of Plumbing Engineers
  - 10. ASSE: American Society of Sanitary Engineering
  - 11. ASTM: American Society of Testing Materials
  - 12. AWWA: American Water Works Association
  - 13. AWS: American Welding Society
  - 14. CFR: Code of Federal Regulations
  - 15. CISPI: Cast Iron Soil Pipe Institute



- 16. EPA: Environmental Protection Agency
- 17. FM: Factory Mutual Engineering Corporation
- 18. Fed. Spec.: Federal Specifications
- 19. GAMA: Gas Appliance Manufacturers Association
- 20. IAPMO: International Association of Plumbing & Mechanical Officials
- 21. ISO: International Organization for Standardization
- 22. MSS: Manufacturers Standardization Society
- 23. NEBB: National Environmental Balancing Bureau
- 24. NEC: National Electric Code
- 25. NEMA: National Electrical Manufacturers Association
- 26. NFPA: National Fire Protection Association
- 27. OSHA: Occupational Safety and Health Administration
- 28. SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Inc.
- 29. UL: Underwriters Laboratories
- 30. WOG: Non-shock Water-Oil-Gas maximum working pressure rating

#### 1.07 SUBMITTALS

- A. Reference Division 1 for submittal requirements when available. If not available, the contractor shall meet the requirements of these specifications.
- B. Submittal Schedule – Provide a detailed submittal schedule including all requirements of this Division and its subdivisions to the Architect and Engineer within thirty (30) days of contract award.
  - 1. Contractor shall submit for the Engineer's approval a Submittal Schedule for the performance of the work that is consistent with the requirements of the project schedule. The Submittal Schedule shall allow reasonable time for the Architect and other consultants review. If the time for Architects/Engineers review is not otherwise specified, the review period (from date of receipt) shall be a minimum of ten (10) business days. Once approved by the Architect/Engineer, submittal dates and time limits established by the Submittal Schedule shall not, except for reasonable cause, be changed or exceeded by the Contractor.
  - 2. For each submittal required by the Contract Documents, the schedule shall include: specification section number, subsection/paragraph identification number, item description (as stated in the applicable specification section, subsection or other Contract Document) and the scheduled delivery date to the Architect/Engineer.
  - 3. Contractor shall be responsible to the Architect/Engineer and/or Owner for all costs, expenses and impact to the project schedule resulting from any deviation to the approved Submittal Schedule, including but not limited to: payment for required overtime, out-of-house resources/consultants or other higher cost resources of the Architect/Engineer as may be required to perform out of sequence, stacked, critical, delayed, unscheduled or multiple reviews of required submittals necessitated by rejection of a prior submittal, (cumulatively and hereinafter, "Additional Review Costs")
- C. General
  - 1. Review is for general conformance with the Contract Documents and is not intended to otherwise approve or verify dimensions, quantities, or to coordinate the Work shown on shop drawings on or between Contractor and the work of other trades or Sections. Contractor is solely responsible for quantities, dimensions, means and methods. Dimensions shall be confirmed and correlated by Contractor at the jobsite prior to the start of the Work (procurement, fabrication, construction or other commencement activities). Contractor's failure to fully verify conditions at the jobsite prior to commencement of the work shall not relieve Contractor of its obligations under the Contract Documents and Contractor shall be responsible for all damages caused by or related to its failure to comply with the requirements of this provision.
  - 2. Submittal review shall be performed to show compliance with the design intent. Contractor shall specifically note any deviations from the Contract Documents and explain the reason and nature of the deviation. Such deviations will be reviewed or

rejected on the submittal. Deviations not so identified shall not relieve the Contractor from the requirements of the Contract Documents.

3. Resubmittals will be reviewed for compliance with comment(s) made on the original submittal only. Architect/Engineer shall not be responsible for changes made upon resubmittal that are not clearly identified (highlighted), and responsive directly to the initial rejection. Resubmittals should not be packaged with non-related first-time submittals, all resubmittals must be marked with the resubmittal number and date and must otherwise comply with all submittal requirements.
4. Submit product data, shop drawings, commissioning plan(s) and checklists, penetration locations, supplemental data, etc. as may be required by the Contract Documents for all materials, equipment and other components of the work included in all Sections of this Division and other provisions of the Contract Documents in accordance with the requirements of this Division and referenced sections.
5. All submittals must be reviewed by Contractor, and bear Contractors review stamp and signoff for Conformity to the Contract Documents, prior to the submission of any required submittal to Architect/Engineer. Submittals that fail to meet this requirement will be considered incomplete, will not be reviewed by Architect/Engineer and will be returned to Contractor, without review and/or rejected and resubmittal will be required. Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
6. Forward all submittals to Architect/Engineer in a coherent, organized fashion, complete and packaged as required herein, Architect/Engineer may reject submittals that fail to comply with this or any other provision of the Contract Documents and Contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
7. Subject to other provisions of the Contract Documents and in the absence of a more stringent requirement, Architect/Engineer will review a submittal not more than two (2) times. If a submittal is required to be reviewed more than twice due to incomplete, or incorrect information the contractor shall be solely responsible for any and all Additional Review Costs and/or other project costs or schedule impact.
8. Identify each submittal item by reference to Specification Section paragraph in which item is specified, or drawing/detail number, as applicable. In addition, for equipment submittals, include identification numbers appearing on the equipment schedule.
9. Identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is necessary to properly identify and check materials and equipment. Words "as specified" are not sufficient identification.
10. Organize submittals in same sequence as they appear in specification sections, articles or paragraphs.
11. All materials and equipment submittals shall have a summary sheet at the front complete with catalog numbers. Where materials or equipment pertain to more than one building, submittals shall clearly indicate at which locations the materials or equipment is to be installed.
12. Submittals shall show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping and/or conduit entrance, access requirements for installation and maintenance, physical size and dimension, electrical characteristics and requirements, foundation/curbs and all permanent and temporary support details as well as all information relating to weight, including but not limited to live and dead weights and other information necessary for component verification and coordination with other trades.

D. Catalog Cuts & Submittal Literature

1. Catalog cuts, submittal literature and published material may be included to supplement scale drawings provided that the actual make and model of equipment being submitted on is identified.
2. Submittal literature, drawings and diagrams shall be specifically applicable to this project and shall not contain extraneous material or optional choices. Clearly mark literature to indicate the proposed item.

E. Shop Drawings:

1. Shop drawings shall include all systems, equipment, and components, including but not limited to all equipment, devices, connections and elevations. Include all related specialty rooms (i.e. mechanical, electrical, data/technology). Drawings shall be at a minimum scale of  $\frac{1}{4}$ " per 1'-0" and shall be fully coordinated with the work of other trades and/or sections.
2. Detail major elements, components, systems, equipment and materials in relationship with other systems, installations, and building components. Identify congested areas and clearly indicate solutions to space problems, developed in conjunction with the work of other trades and/or Sections. Identification of space problems without proposed solutions is not acceptable and is grounds for rejection. For such areas indicate, superimposed, the work of all trades and/or Sections involved and:
  - a. Clearly identify each area of congestion and deviations from the Contract Documents, and:
  - b. Proposed solution(s), clearly documented and signed-off by all other trades and/or Sections involved.
3. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
  - a. Planned system distribution layout, including specialty device locations and access for operation
  - b. Clearances for installing and maintaining insulation.
  - c. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
  - d. Equipment and accessory service connections and support details.
  - e. Other systems installed in same space.
  - f. Exterior wall and foundation penetrations.
  - g. Fire-rated wall and floor penetrations.
  - h. Ceiling and wall-mounted access doors and panels required to provide access to operating devices or items needing access for proper maintenance
  - i. Sizes and location of required concrete pads and bases.
  - j. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
  - k. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
- F. Anchorage and Supports: Submit details and calculations for support and anchors that are not specifically detailed on the drawings. All calculations must meet current seismic and structural code.
  1. Provide seismic restraints in accordance with ASCE Standard 7 requirements for piping, ductwork, and mechanical equipment.
  2. Provide engineering for seismic restraint system, assemblies, and components.
  3. Provide shop drawings and installation instructions for seismic restraint system.
  4. Provide final inspection and report for installed restraint system acceptance.
  5. Where pre-approved bracing systems will be employed, submit:
    - a. System component brochure describing components used and detailed installation instructions.
    - b. Loads to be transmitted to the structure at anchor points.
  6. Where anchorage, support, and bracing are not detailed on the drawings, and pre-approved systems are not used, submit details and calculations of proposed systems. Include:
    - a. Anchorage and Supports
      - 1) Where equipment substitutions change the weight, size, configuration, or other aspects of systems and equipment that will affect the performance of anchorages and/or supports, submit calculations for proposed anchors and supports, and install them as shown in these calculations.

- 2) Where substitutions will have no effect on anchors and supports detailed on Contract Documents, submit information on sizes, weights, center of gravity and other relevant information to demonstrate this fact.
7. Seismic Engineer: Professional engineer currently licensed in state where project is located as a structural, civil, or mechanical engineer. Responsible for designing, applying, and inspecting custom seismic restraint components in accordance with applicable codes.
- G. Shop Fabrication Drawings: Drawings are for the Contractor's use and shall be its responsibility. Do not submit shop fabrication documents unless specifically requested.
- H. Testing: Coordinate Shop Drawings to include any additional components for proper system testing.
- I. Certificates: Submit final inspection certificates signed by governing authorities.
- J. Operating and Maintenance Instructions and Manuals.
  1. Three (3) complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished to the Owner within ninety (90) days of issuance of final occupancy permit. Each set shall be electronic or permanently bound with a hard cover. The following identification shall be inscribed on the covers, "OPERATING AND MAINTENANCE INSTRUCTIONS", the name and location of the building, the name of the Contractor, and the Contract number. Flysheets shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8 1/2" x 11" with large sheets of Drawings folded in.
  2. PDF electronic file: Assemble each manual into a composite electronically indexed file.
    - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
  3. Instructions on major items, including but not limited to: pumps, air compressors, boilers, specialty units, fans, air handlers, AC units and temperature controls, shall be by representative of manufacturer of respective equipment.
  4. Submit as identified below and as noted in other specification references.
    - a. Names, addresses and phone numbers of contractors and subcontractors. List of all system components, with the name, address, and 24-hour phone number of the company responsible for servicing each item during the first year of operation.
    - b. Complete operating and maintenance instructions and parts lists of all equipment and component parts. Data sheets to show all connections, ratings, characteristics, wiring connections, catalog data on component parts whether furnished by equipment manufacturer or others, names, addresses and telephone numbers of source of supply for parts subject to wear or failure, and description of operating, test, adjustment, and maintenance procedures.
      - 1) Where data sheets included in manual cover equipment, options, or other features not part of equipment actually furnished, line out these references or otherwise clearly mark so remaining text, diagrams, drawings, schedules, and similar information shall apply specifically to equipment furnished.
    - c. Operating Instructions should include, but not be limited to:
      - 1) Normal starting, operational and shutdown procedures, including emergency procedures for each type of equipment/system.
      - 2) Equipment wiring and control diagrams.
      - 3) All other items as may be specified/required by this Section and the Contract Documents.
    - d. Maintenance Instructions
      - 1) All items as may be specified/required by this Section and the Contract Documents.
    - e. Manufacturers Data (each piece of equipment)
      - 1) Installation instructions
      - 2) Drawings & specifications
      - 3) Parts List, including recommended stock and long lead parts/components.
      - 4) Wiring and riser diagrams.

- 5) Warranties and guarantees for all equipment, materials and components, including repair, replacement and labor from both Contractor and manufacturer as required by the Contract Documents.
  - 6) Certificates of Installation – manufacturer's certification of supervision during equipment installation and start-up procedures.
  - 7) All other items as may be specified/required by this Section and the Contract Documents.
- K. Record Documents.
1. Maintain one (1) complete set of prints and specifications at the job site exclusively for recording deviations from the drawings which are necessary because of job conditions, request for information and/or approved change orders. Record locations and depths of buried and concealed system components from fixed, easily identifiable objects, such as building walls or other fixed physical objects. Where systems are concealed in walls or other fixed physical objects, indicate distances from building corners or other building features not likely to be disturbed by future alterations.
  2. Submit Record Drawings within 90 days of system acceptance by owner.
- L. Drawings, specifications (as-builts) and approved submittals.
1. Where the project uses a BIM model the contractor shall keep the model updated in a similar fashion, maintaining the current project record as described above and submit, in addition to all other requirements of this Section and other provisions of the Contract Documents a complete and accurate BIM model for the project.
  2. Prior to Substantial Completion, obtain from the Architect a complete set of printed drawings at the Contractor's cost. Record all revisions to these drawings to indicate as-built conditions. Indicate all changes, including RFI's, on this set of documents. Submit one set of blueprints of these revised drawings for review. Make necessary changes and deliver to Architect one set of electronic documents, including any BIM model, upon Final Completion and Acceptance.
  3. All test reports, certifications, and inspection reports.
  4. AHJ/Specialty AHJ Approvals (i.e. Fire Marshal and/or Fire Department system approvals).
  5. Substantial and Final inspection certificate signed by governing authorities.
  6. All other items as may be specified/required by this Section and/or other provisions of the Contract Documents.
- M. Definitions of comments used in submittal review:
1. "No Exception Taken" The meaning and intent of this statement is that the Engineer finds no objection (except those noted thereon or in correspondence) to inclusion of items or Work indicated in construction provided that it:
    - a. Complies with Contract Drawings and Specifications as to quantities, space requirements, and dimensions.
    - b. Does not interfere with other trades.
    - c. Is not the cause of union tradesmen disputes.
    - d. Does not infringe on patent rights.
    - e. Is not the cause of injury or damage to persons or property.
    - f. Complies with OSHA regulations.
  2. "Rejected" The meaning and intent of this statement is that the submitted material does not conform to plans and specifications. Resubmittal of a different product or shop drawing is required.
  3. "Revise and Resubmit" This statement is used when the general product line is acceptable, but the submitted material varies in dimension, accessories, etc. from what is required. Resubmittal is required.
  4. "Make Corrections Noted" This statement is used as an alternative to "Revise and Resubmit" when resubmittal is not required.
  5. Said review does not relieve Contractor of any Contractual responsibilities.

#### **1.08 TEMPORARY FACILITIES AND CONTROLS**

- A. Refer Division 01 – General Requirements when available. If not available, the Contractor shall meet the following requirements.
- B. Use of Project equipment for temporary service during construction is not allowed.

#### **1.09 EQUIPMENT DEVIATIONS AND SUBSTITUTIONS**

- A. Substitutions will only be considered after project award. No substitutions will be considered during bid and/or negotiation periods.
- B. See Division 1 for requirements and procedures related to Deviations and Substitutions. Unless specified elsewhere in the Contract Documents, a minimum of ten (10) business days shall be allowed for evaluation. The burden of all systems re-engineering/design, testing, suitability, and constructability is solely placed upon the Contractor for all deviations from the basis of design as reflected in the Contract Documents.
- C. No substitutions will be allowed and/or considered unless the description of a product includes the phrase “approved equal” and then only upon a determination as to equivalency and impact upon the project budget, schedule, and the work of others, including any redesign of the project or its system components by the Architect, Engineer, or other trades. The final determination as to sufficiency or acceptance of any such substitution and/or deviation properly requested and submitted by Contractor will lie solely with the Architect/Engineer. Contractor may not implement substitutions that have not been approved by Architect/Engineer.
- D. Where the contractor proposes to use an item or equipment other than that specified or detailed on the drawings which requires any redesign of any portion of the project, including but not limited to the mechanical, electrical, plumbing, structure, or architectural design or any of their respective subcomponents. Contractor shall be responsible to the Architect/Engineer and/or Owner for all costs, expenses and impact to the project budget and/or schedule resulting from any required investigation, analysis or redesign, including but not limited to; payment for required overtime, out-of-house resources/consultants or other higher cost resources of the Architect/Engineer, Owner or AHJ as may be required to perform the investigation, analysis or redesign (cumulatively and hereinafter, “Deviation Review Costs”)
- E. If approved by Architect/Engineer, all such redesign, including all new drawings and detailing required, will be prepared by the Architect/Engineer and their sub-consultants for Change Order documentation for approval by Owner and the Authority Having Jurisdiction will be paid by the Contractor as part of the Deviation Review Costs.

#### **1.10 COORDINATION**

- A. Prior to construction, coordinate installation and location of systems, devices and equipment with architectural and structural requirements, and other trades (including ceiling suspension, and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.
- B. Drawings and corresponding electronic media are diagrammatic and indicate the general arrangement of systems and work included in the Work. Consult the drawings, details and other electronic media for locations of fixtures and equipment; where same are not definitely located, obtain this information from the Architect/Engineer.
- C. Check drawings and related electronic media of other trades to verify spaces and conditions in which work will be performed prior to commencement of the work.
- D. If directed by the Architect/Engineer or required for proper installation, execution and coordination of the work, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed.
- E. Take all dimensions from Architectural and Structural Drawings, certified equipment drawings and from the actual field measurements before fabricating work. All conflicts shall immediately be reported to the Architect/Engineer. Contractor is solely responsible for conflicts known or

which reasonably should have been know but not reported or resolved before commencement of the work

- F. Equipment furnished shall fit in allocated space with due provision for manufacturer's recommended access and proper maintenance requirements. Verify and coordinate space requirements with all trades and equipment which comprise the Work.
- G. Prior to construction, coordinate the Work with that of other trades and building components. Prepare coordination drawings (or other specified electronic media) for all major trades, utilities and other primary systems routing in conjunction with the contract documents to maximize the pre-installation planning and coordination of trades, utilities and systems and minimize the requirement to manage field coordination through the RFI's, ASI's or other similar processes.
- H. Coordinate connection of systems with interior/exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- I. Before submitting a bid for the work the Contractor shall visit the site and become familiar with all the work on other related Drawings and Specifications, and plan the work to provide the best possible assembly of the combined work of all trades. No additional costs will be considered for work which has to be relocated due to conflicts with other trades.
- J. If, after examination of the bidding documents relating to the work, the Contractor has queries concerning the nature and scope of the work or intent of the Specifications, he/she shall promptly request clarification from the Architect/Engineer. After contract award, claims of ignorance of the intent and scope of the contract shall not be allowed.
- K. Contractor is responsible for coordinating the schedule of inspections by Engineer at appropriate stages of construction such as rough-in, pre-final, and final, and at other times required by the Specifications or by the construction. Notify Architect and Engineer ten (10) business days in advance of proposed site visit. Notification constitutes certification that construction is, or will be, complete and ready for observation. In the event that construction is not ready for observation, contractor shall bear the cost of additional site visits.

#### **1.11 ACCESSIBILITY**

- A. Contractor is responsible for verifying that equipment and devices will fit within the space shown on the drawings. Contractor shall locate all equipment which must be serviced, operated or maintained, in fully accessible locations.
- B. Minor deviations from the drawings may be made to allow for better accessibility, but changes of magnitude or which involve extra cost shall not be made without approval from the Architect/Engineer.

#### **1.12 QUALITY ASSURANCE**

- A. Regulatory Requirements: Work and materials installed shall conform with all local, State, Federal and other applicable laws and regulations.
- B. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.
- C. Installer Qualifications: Company specializing in performing the work of this section with a minimum 5 years documented experience. Company personnel shall be approved by manufacturer for all product installations and required training.
- D. Conform to all applicable standards, codes and regulation and industry best practice requirements.
- E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.
- F. All materials and equipment shall be new, shall bear manufacturer's name, and shall conform to the grade, quality and standards specified herein. Type, capacity and application shall be suitable and capable of satisfactory operation for the purpose intended. All equipment and components shall include UL label and/or marking on equipment body/device including

manufacturer's name, pressure rating(s), electrical classification(s), limits and ratings as applicable to individual components for the purpose specified and intended.

- G. Equipment Selection: Equipment allowed by the specifications but with different electrical characteristics, physical dimensions, capacities, and/or ratings than what is shown on the Drawings may be furnished, provided such proposed equipment is approved in writing and connecting mechanical and electrical services, such as pipe and/or duct connection sizes, circuit breakers, conduit, motors, bases, and equipment spaces are revised to accommodate such equipment. Maintain a minimum duct length of three straight diameters at all fan inlets and outlets. All expenses shall be borne by the Contractor. Specified minimum energy ratings and/or equipment efficiencies must meet design and commissioning requirements.
- H. ASME Compliance: ASME listed water heaters and boilers with an input of 200,000 BTUH and higher, hot water storage tanks which exceed 120 gallons, and hot water expansion tanks which are connected to ASME rated equipment or required by code or local jurisdiction.
- I. Provide safety controls required by National Boiler Code (ASME CSD 1) for boilers and water heaters with an input of 400,000 BTUH and higher.
- J. Listing and labeling: Provide motors that are listed and labeled. Terms "listed and labeled": as defined by UL, NEC, Article 100 or other applicable recognized agency as specified in the Contract Documents.
- K. Cutting & Patching: Unless otherwise required by the Contract Documents, Contractor shall be responsible for all cutting, fitting and patching required to complete the Work, or to make portions of the Work and existing conditions fit together properly, and all such areas shall be restored to the conditions existing prior to the cutting, fitting and patching unless otherwise provided in the Contract Documents
- L. Lead Free Requirements: Contractor shall endeavor to use lead free products and where required by law, ordinance, regulation or standard, all materials products and practices shall comply with limitations and requirements as to the allowable limits and/or percentages of lead. Lead free products must be certified by and independent 3rd party.
  - 1. This provision shall apply to any and all similarly regulated materials, products and practices that may be considered hazardous or are otherwise regulated by applicable law, ordinance regulation or standard in the project local.

#### **1.13 DELIVERY, STORAGE, AND HANDLING**

- A. All materials and equipment shall be adequately covered and protected against dirt, water, chemical or mechanical damage, and theft. At completion, all work, equipment and materials shall be cleaned, and damage repaired by Contractor. Damaged equipment will be replaced by the contractor if Owner does not accept repairs done to the equipment. Such replacement shall be scheduled to minimize building system interruption of occupied or scheduled for occupancy.
- B. Material delivered at the site shall not be left exposed to the weather or left unattended. Deliver pipes, tubes and conduit with factory-applied end-caps. Contractor shall be responsible to maintain end-caps or provide temporary end caps on all open-ended piping, tubes and conduit through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.
- C. Protect bright finished shafts, bearing housings and similar items until in service.
- D. Protect plastic pipes and materials from sunlight and support to prevent sagging and bending.
- E. Elevate stored materials above grade. When stored inside, do not exceed structural capacity of the floor.
- F. Provide protective coatings to materials to prevent damage and/or infiltration of moisture and dirt on all materials and equipment including but not limited to cast iron and steel valves.
- G. Contractor shall check the openings in the building and the size of the doors, passages, and openings through which equipment is to be admitted. Wherever necessary, he shall provide the equipment in sections or knocked down in order to admit the equipment through these openings.



- H. Contractor shall provide all rigging, erection and hoisting equipment as required to handle or place equipment and piping in position. This rigging and hoisting equipment shall only be attached and placed on the structure in locations as approved by Architect/Engineer at the site. Section 016000 "Product Requirements."

#### **1.14 PERMITS AND FEES**

- A. Contractor shall arrange and pay for all permits, fees, and inspections required to perform the Work. The Contractor shall present the Owner with properly signed certificates of final inspection before the Work will be accepted.
- B. Contractor shall call for all inspections by local building official(s) when they become due, and shall not cover any work until approved by these governing authorities.
- C. Contractor shall make all arrangements with utility companies for water, steam, gas and drainage services, etc., associated with the work and include required payments for meters, piping, services, connection charges and materials furnished and installed by utility companies. Work and materials shall be in strict accordance with rules of respective authorities.

#### **1.15 DOCUMENT OWNERSHIP**

- A. The Drawings and Specifications, combined with the calculations, field data, notes, and reports, are the intellectual and real property of the Architect and/or Engineer. This covers all forms of written and recorded or electronic media. The reuse of these documents without specific permission of the Architect and Engineer is prohibited. The Drawings may be employed by the Owner and Contractor for the express use of constructing, commissioning and operating the facility only upon proper execution of an Agreement for Use of Electronic Files & Data.

#### **1.16 GUARANTEE AND WARRANTY**

- A. Refer Division 01 – General Requirements when available. If not available, the Contractor shall meet the following requirements.
- B. Contractor warrants to Owner that the materials and equipment provided under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects. Work, materials and equipment not conforming to these requirements, including substitutions not properly approved by Change Order, shall be considered defective. This warranty excludes remedy for damage caused by improper or insufficient maintenance, improper operation or normal wear, tear and usage. Contractor shall assign to Owner, or otherwise assure the Owner has the full benefit of, all warranties and guarantees of manufacturer, subcontractors, sub-subcontractors and suppliers, and Contractor shall perform the Work in a manner that does not adversely affect or invalidate any available warranties or guarantees.
- C. Contractor shall warrant and guarantee all work against faulty material or workmanship for a period of one (1) year from the date of final completion and written acceptance by the Owner, unless specified more stringently elsewhere in the Contract Documents.
- D. If the project is occupied or the systems placed in operation in several phases at the request of the Owner, the guarantee of each system or piece of equipment used shall begin on the date each system or piece of equipment was placed in satisfactory operation, tested, commissioned and accepted, in writing, by the Owner. The use of building equipment for temporary service and testing or phases of work completed prior to the projects final completion and acceptance by the Owner does not constitute the commencement of the warranty period.
- E. If a defect or deficiency in the Work is discovered within the one (1) year Warranty & Guarantee period or within such longer period as may be prescribed by the Laws or by any specific guarantee, and Owner elects to have Contractor correct such defect or deficiency, Owner shall notify Contractor of such defect or deficiency in writing. This period of correction relates only to the specific obligation to correct defects and deficiencies and in no way otherwise limits the Contractor's responsibility for Work that is not in accordance with the Contract Documents, If Contractor fails to timely correct defects or deficiencies in the Work, Owner may, at its sole option, correct them and charge contractor for all cost therefore.

- F. Specific exclusions, if any, from this one (1) year warranty and guarantee period are listed in the individual specification sections.

#### **1.17 LIMITATIONS OF LIABILITY**

- A. To the extent any of the following provisions are not more stringently included in the Contract Document the following Limitations of Liability shall apply:
- B. Architect/Engineer is not responsible for Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, and is not responsible for Contractor's failure to perform or furnish the work in accordance with the Contract Documents.
- C. In the event that Architect/Engineer's employees or sub-consultants make comments or issue warnings about safety issues, such comments and warnings shall be considered to have been offered by a Good Samaritan and shall not impose any obligation or responsibility.
- D. Engineer will not be responsible for the acts or omissions of Owner, Contractor, any subcontractor, any supplier, or of any other person or organization performing or furnishing any of the portions of the work
- E. Contractor understands and acknowledges that Engineer is not authorized to order extra work or issue Change Orders to the work, however in the event and to the degree that Engineer may offer advice, suggestions, and opinions Contractor shall not rely on such advice, suggestions, and opinions unless directed in writing by Owner or its designated representative, and shall, in no event, make any claim against the Engineer for any such advice, suggestions, and opinions.
- F. To the fullest extent permitted by law, Contractor shall indemnify and hold harmless Architect, Engineer, and their joint ventures, officers, directors, partners, employees and agents from and against any and all claims, costs, losses and damages (including but not limited to all fees and charge of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused in whole or in part by the negligent acts or omissions of Contractor, Contractor's officers, directors, partners, employees, agents; or contractor's subcontractors or material men in the performance of Work. Contractor shall direct its insurer to list Architect, Engineer, and their joint ventures, as Additional Insureds on general liability insurance policies covering this project. Prior to commencing work, Contractor shall submit copies of its certificate of insurance to both Architect and Engineer.

#### **1.18 SAFETY**

- A. Contractor shall comply with all OSHA regulations. Contractor is required to obtain and pay for insurance required to cover all activities within Contractor's Scope of Work.

### **PART 2 – PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. See Drawings for equipment data, capabilities, and requirements. Manufacturers are identified for the purpose of establishing quality; alternative manufacturers of equal quality are acceptable. If alternative manufacturers are proposed it is the contractor's responsibility to verify and demonstrate the proposed alternative is equivalent.
- B. Provide like items from one manufacturer, including but not limited to pumps, fans, valves, control devices, air handlers, vibration isolation devices, etc.

#### **2.02 MATERIALS**

- A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL approved or have adequate approval or be acceptable by State, County, and City authorities. Provide all materials omitted herein but necessary to complete the work.
- B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.
- C. All electrical materials shall bear the label of, or be listed by, the Underwriters' Laboratories (UL), unless the material is of a type for which label or listing service is not provided.

- D. Hazardous Materials: Comply with local, State and Federal regulations relating to hazardous materials. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

### **2.03 ACCESS PANELS**

- A. Confirm Access Panel requirements in individual Division 23 sections. Comply with the following:
1. Provide flush mounting access panels for service of systems and individual components requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly. Ceiling access panels to be minimum of 24 x 24 or as required and approved size. Wall access panels to be minimum of 12 x 12 or as required and approved size.
  2. Coordinate final door location with the devices which require access and architectural finishes.

### **2.04 DRAIN PANS**

- A. Provide drip pans under all hot water heaters, above-ceiling inline pumps, cooling coils and heat recovery coils. Locate pan immediately below piping and equipment, and extend a minimum of 6" on each side and lengthwise 18" beyond equipment being protected. Pans shall be 2" deep and fabricated from reinforced sheet metal (20 gauge copper or 20 gauge steel with two ounces zinc finish hot dipped after fabrication) with rolled edges and soldered or welded seams. Provide 3/4" copper drainage piping, properly discharged to floor drain, hub drain, or as shown on Drawings. Provide condensate pumps as necessary. Comply with Oregon Mechanical Specialty Code for overflow protection and pipe sizing.

### **2.05 GUARDS**

- A. Provide guards in accordance with State Safety Code and OSHA requirements over all rotating equipment including belts, shafts and couplings. Drive guards over belts and sheaves shall include 2-1/2" diameter access opening at shaft ends for speed counter.

### **2.06 PENETRATION FIRE STOPPING**

- A. Through-penetration fire stopping system tested and listed by Underwriters Laboratories and ASTM E 814-88: Standard Test Method for Fire Tests of Through-Penetration Firestops.
- B. Select system for proper application based on wall construction, type of penetrating item, wall rating, etc. Each product shall be listed for use in its intended application.
- C. Fire Stop assembly shall be able to withstand standard fire and hose stream test (F Rating) and limit temperature rise (T Rating) of penetrations on protected side as required by Authorities Having Jurisdiction. Conform to ASTM E 814.

### **2.07 MISCELLANEOUS STEEL**

- A. Provide all steel as required for adequate support of all mechanical equipment. Use standard angle or channel, I or H sections as required by application. Adequately cross-braced and welded pipe stands may be used for tank supports. Provide suitable base plates for all stands and anchors for all hanging equipment. Drill or burn support holes only in flanges of structural shapes and only in one leg of any one angle, and as far from center of length as possible.
- B. Paint: Apply one coat of black Rustoleum primer to shop fabricated items before delivery to the job; other painting as specified herein.

## **PART 3 – EXECUTION**

### **3.01 GENERAL MECHANICAL INSTALLATIONS**

- A. General: Sequence, coordinate, and integrate the various elements of the mechanical systems, materials, and equipment. Comply with the following requirements:
1. Coordinate systems, equipment, and materials installation with other building components.
  2. Verify all dimensions by field measurements.

3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for system installations.
  4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
  5. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
  6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
  7. Coordinate connection of systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
  8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
  9. Install systems, materials, and equipment level and plumb, and parallel or perpendicular to other building systems and components, where installed exposed in finished spaces.
  10. Install equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
  11. Install access panel or doors where units are concealed behind finished surfaces. Coordinate with other divisions.
  12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
  13. Replace all air filters with new filters upon Owner taking occupancy of the building or at a time mutually agreed upon between the Owner and Contractor.
  14. Do not install ductwork or piping in elevator machine rooms, electrical and/or communication rooms unless it directly services that room.
- B. Locate wall, floor and ceiling fire ratings from architectural drawings for appropriate hourly rating of combination fire/smoke dampers or fire dampers shown on mechanical drawings.

### **3.02 CONTINUITY OF SERVICE**

- A. Contractor, in the performance of the Work shall plan for and incorporate into the work the continuity of services. Where the continuity of service(s) is required to be interrupted Contractor shall plan and schedule the work to minimize interruptions to the facility and its normal operations, prearrange and coordinate all outages/interruptions with Owner's representative, utilities and the work of others. Requests for system interruptions/outages must be submitted at least (5) days prior to intended shutdown time and then subject to Owner's adjustment and/or approval.
- B. For connections that require a significant interruption to facility operations (as determined by the Owner), Contractor shall provide for Owner's written approval a detailed plan, schedule and description of the work for each system interruption. The plan shall include a description and schedule of each work item to be completed, designation of site supervisor and contact information, designated work crew as well as facility access and egress points for materials, manpower and equipment, contingency plan for parts, materials and equipment as well as a program to restore systems in the event of unplanned disruption or inability to complete the work in the timeframe scheduled and approved by Owner. Contractor shall confirm scheduled dates with the Owner and provide a minimum of five (5) days advance notice for each operation.
- C. Where possible and subject to Owners sole discretion, connections to existing systems shall be performed during normal operating conditions. Unless required otherwise (specifications, code, practice, etc.) all tap connections shall be 'live', 'wet' or 'hot', with the proper safety programs and procedures for isolating system components to ensure the safety of the workforce,

occupants and the facility.

- D. Contractor shall include all costs for overtime labor, expedited materials, equipment and contingency planning as necessary to maintain continuity of services, schedule and complete necessary connections. Contractor shall also include provisions for maintaining any and all supplemental systems that may be required to remain in service for the safety, protection and critical operations of the facility and its occupants including but not limited to: Fire Alarm, Security, Phone/Data, BAS, Emergency Power and similarly related critical or emergency systems. Such provisions shall include but not be limited to temporary power, lighting, materials, equipment and/or installations (including removal and cleanup thereof) required to maintain such systems and as required to safely and properly complete the work.
- E. Contractor shall be liable for any and all damages resulting from unscheduled outages/interruptions or for those not confined to the pre-approved timeframes to complete the work.

### **3.03 DEMOLITION**

- A. Comply with individual Division 23 sections and the following:
  - 1. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas.
  - 2. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve utilities. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.
  - 3. Equipment: Unless otherwise directed, equipment, fixtures, or fittings being removed as part of demolition process are Owner's property. Remove other items not scheduled to be reused or relocated from job site as directed by Owner.
  - 4. Unless specifically indicated otherwise on Drawings, remove exposed, unused systems to behind finished surfaces (floor, walls, ceilings, etc.). Cap and patch surfaces to match surrounding finish.
  - 5. Unless specifically indicated otherwise on Drawings, remove unused equipment, fixtures, fittings, rough-ins, and connectors. Removal is to be to a point behind finished surfaces (floors, walls, and ceilings).
- B. If duct, pipe, insulation, conduits, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Reuse of Materials: Reuse of materials is prohibited unless specifically indicated or approved by Architect.
- D. Notify Architect in discovery of any hazardous materials.
- E. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

### **3.04 MECHANICAL SYSTEMS - COMMON REQUIREMENTS**

- A. General: Install mechanical systems as described below, unless piping Sections specify otherwise. Individual Division 23 Sections specify unique installation requirements.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of systems. Indicated locations and arrangements were used to size pipe and duct and calculate friction loss, expansion, pump sizing, fan sizing, and other design considerations. Install piping and ductwork as indicated, unless deviations to layout are approved on Coordination Drawings.
- C. Install piping at indicated slope.
- D. Install components with pressure rating equal to or greater than system operating pressure.
- E. Install piping and ductwork in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping and ductwork free of sags and bends.

- G. Install exposed interior and exterior piping and ductwork at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- H. Install piping and ductwork tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- I. Install piping and ductwork to allow application of insulation plus 1-inch clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. Install flexible connectors according to manufacturer's written instructions, and where indicated and specified in other Division 23 sections.
- L. Install flexible expansion loops according to manufacturer's written instructions, and where indicated and specified in other Division 23 sections.
- M. Install fittings for changes in direction and branch connections.
- N. Install couplings according to manufacturer's written instructions.
- O. Install Portable Instrument Connections in all piping systems where DDC temperature and/or pressure sensors and thermometers and/or pressure gauges are located.
- P. Do not route piping through elevator equipment rooms, unless specifically allowed by local authority.
- Q. Do not route piping over electrical panels, transformers, switchgear or other electrical equipment.
- R. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
  - 1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish. Use split-casting escutcheons if required, for existing piping.
  - 2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
  - 3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
  - 4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
  - 5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.
- S. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
- T. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 1. Build sleeves into new walls and slabs as work progresses.
  - 2. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
    - b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
    - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. If available, refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
      - 1) Seal space outside of sleeve fittings with non-shrink, nonmetallic grout.
    - d. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.
- U. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing sleeve

- seals.
1. Install steel pipe for sleeves smaller than 6 inches in diameter.
  2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
  3. Assemble and install sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- V. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using sleeve seals. Size sleeve for manufacturer's recommended clear space between pipe and sleeve.
1. Assemble and install sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
  2. Caulk exterior side of annular space once the sleeve seal is in place using an elastomeric joint sealant.
- W. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe and duct penetrations. Seal pipe and duct penetrations with firestopping materials. If available, refer to Division 7 Section "Firestopping" for materials.
- X. Verify final equipment locations for roughing-in.
- Y. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- Z. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
  2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
  3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
  4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
  5. 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:
  6. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
  7. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
  8. Align threads at point of assembly.
  9. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
  10. 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.
    - a. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators.
    - b. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench to recommended torque values.
- AA. Piping Connections: Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
  2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.

3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

**BB. Identification**

1. Valves:
  - a. Attach 1 1/2" square brass tags stamped with designating number 1/2" high, filled in with red enamel, to each valve.
  - b. Securely fasten valve tag to valve spindle or handle with a brass chain.
2. Schedules and Charts:
  - a. Furnish to Owner's representative three (3) complete framed plastic laminated valve tag schedules. Schedule shall indicate tag number, valve location by floor and nearest column number, valve size and fire area controlled.
  - b. Furnish three (3) framed plastic laminated diagrammatic charts showing schematically the complete sprinkler system, with major control valves and valve numbers.
  - c. Furnish one (1) framed plastic laminated placard at each sprinkler riser, indicating the basic hydraulic data as required by NFPA 13 or local Fire Marshal.
3. Piping Identification:
  - a. Apply color coded polyvinyl chloride pipe bands identifying service and direction of flow.
  - b. On exposed piping, apply bands at 20'-0" on centers at straight runs, at valve locations, and at points where piping enters and leaves a partition, wall, floor, or ceiling.
  - c. On concealed piping installed above removable ceiling construction, apply bands in manner described for exposed piping.
  - d. On concealed piping installed above non-removable ceiling construction, or in pipe shafts, apply bands at valves or other devices that are made accessible by means of access doors or panels.
  - e. Apply bands at exit and entrance points at each piece of equipment.
  - f. Band widths shall be 8" for pipes up to 10" diameter, and 16" for larger diameter piping. Letter heights stating service shall be pre-printed on band, 3/4" high for 8" bands and 1 1/4" high for 16" bands.
  - g. Colors shall conform to ANSI Standard A13.1.
  - h. Letter size shall conform to ANSI A13.1.
  - i. Tags and bands shall be approved for this service.

**3.05 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS**

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated. Supports shall be neatly placed and properly fastened. All equipment shall be fastened in place with bolts.
- D. Install 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.

**3.06 ERECTION OF METAL SUPPORTS AND ANCHORAGE**

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor materials and equipment.
- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."



### 3.07 DRAWINGS

- A. The Drawings show the general arrangement and location of the ductwork, piping and equipment. Work shall be installed in accordance with the Drawings, except for changes required by conflicts with the work of other trades. The Contractor shall provide for the support, expansion, and pitch of any rearranged piping in conformance with the intent of the Drawings, Specifications, and codes.
- B. Note that certain mechanical work is shown, wholly or in part, on Architectural Drawings.
- C. Mechanical Drawings are diagrammatic and are intended to show the approximate location of equipment and piping. Dimensions shown on Drawings shall take precedence over scaled dimensions on Drawings. All dimensions shall be verified in the field by the Contractor.
- D. The exact location of apparatus, equipment, and piping shall be ascertained from the Owner or the representative in the field, and work shall be laid out accordingly. Should the Contractor fail to ascertain such locations the work shall be changed at Contractor's own expense when so ordered by the Owner. The Engineer and owner reserve the right to make minor changes in the location of ductwork, piping and equipment up to the time of installation without additional cost.
- E. It is the intention of the Drawings and Specifications that, where certain mechanical items such as unions, expansion joints, and other mechanical components are not shown, but where such items are required by the nature of the work, shall be furnished and installed.
- F. The Mechanical Drawings and Specifications are intended to supplement each other. Any material or labor called for in one shall be furnished even though not specifically mentioned in the other.
- G. Pipe and duct sizes shown are the minimum allowable and shall be increased in size if required by code or wherever necessary to meet unusual conditions.

### 3.08 DAMAGE

- A. Repair any damage to the building, premises, and equipment occasioned by the work under this Section and all other Sections.
- B. Repair all damage to any part of the building or premises caused by the Work installed under this Section until the warranty period expiration date.

### 3.09 EARTHWORK

- A. General: Perform earthwork required for installation of new work below grade in accordance with referenced specifications.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of the pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated. Grade trench bottoms to provide uniform bearing and support for each section of pipe. Form holes and depressions for joints after trench bottom has been graded. Provide temporary pumping equipment to keep excavation free from water. Install pipe bedding in rock excavation consisting of not less than 6 inch of sand or equivalent material.
- C. Provide bracing and shoring as necessary.
- D. Backfill trenches only after completion of pressure tests and inspection. Carefully compact material under pipe and bring backfill evenly up on both sides and along the full length of piping or conduit. Cover to 12-inch thickness over top of pipe. Fill and tamp remainder of backfill material in 6-inch layers. Provide backfill materials generally consisting of clean earth or sand relatively free of clods or stones. For sewer and water piping, use pea gravel. For gas piping, use sand. Backfill under, around, and to 6 inches above top of piping.
- E. Compact soil to 6-inch layer (maximum) loose thickness of backfill. Where roadway or parking area surfaces will be placed over backfill, provide moisture conditions, which will produce compacted density of 95 percent of maximum density. Elsewhere, 90 percent. Test in accordance with Divisions 1 and 2 (if applicable) and local code requirements (most stringent to prevail).

- F. Take special care in compacting under services where they enter building to prevent settling. Contractor fully responsible for damage to piping and property as a result of settling around service piping.
- G. Dispose surplus materials off-site in a suitable location.
- H. Place and maintain barricades, construction signs, torches, lanterns, and guards as required during periods of open excavation to protect persons from injury and to avoid property damage.
- I. Leave premises thoroughly clean at completion of earthwork.
- J. Wherever piping is to be installed in areas, which have been excavated below pipe inverts, for any purpose, install piping to prevent subsequent settlement. Do not install piping until backfill is to full compaction, completed to minimum 18 inch above installed pipe. Install piping in re-excavated trenches and backfill as previously specified.

### **3.10 CONCRETE WALLS AND CONCRETE FOOTINGS**

- A. Where pipes must pass through concrete walls and footings, they shall pass through SDR 35 PVC pipe sleeves with 1/2" annular space set in place at time of construction.
- B. Ducts shall pass through 10 gauge galvanized sheetmetal sleeves. Provide sheetmetal closure collars at duct penetration.
- C. Sheetmetal sleeves set into concrete walls: Provide steel frame around opening where required by Structural Engineer.
- D. Coordinate core drilled openings with General Contractor. Coordination shall include location, size, and spacing of openings. No slot openings will be allowed. Coordinate openings to avoid critical structural items such as reinforcing bars, tensioning tendons, etc.

### **3.11 ELECTRICAL REQUIREMENTS - CONTROLS AND COORDINATION WITH ELECTRICAL CONTRACTOR**

- A. Contractor shall coordinate with the Electrical Contractor on furnishing and installing of controls, motors, starters, etc. Coordinate means informing Electrical Contractor of items requiring electrical connection, providing copies of submittal data, installation data, scheduling work to ensure efficient progress, and promptly supplying those items to be installed by Electrical Contractor.
- B. The specific requirements for electrical power and/or devices for each and every piece of mechanical equipment requiring electrical service, supplied and/or installed under this Contract, shall be coordinated and verified with the Mechanical drawings and specifications, and with the manufacturers of the equipment supplied. This shall include the voltage, phase, and ampacity; conduit requirements; and exact location and type of disconnect, control, and/or connection required. Any changes from the Drawings and Specifications required as a result of this coordination shall be part of this Contract.
- C. Electrical Contractor shall furnish and install the following for all mechanical equipment:
  - 1. Conduit and wiring for line voltage power to the equipment.
  - 2. Disconnect switches.
  - 3. Manual motor starters.
  - 4. Magnetic motor starters when part of a motor control center. See Division 26 and Drawings for further information.
- D. The work under this Section shall include furnishing and installing all controls on low and manual line voltage, including thermostats, auxiliary switches, relay wiring, interlock wiring; equipment control panels and transformers; and controls conduit unless specifically indicated as part of other work. Materials and methods of the control installation shall be in accordance with the Electrical Specifications.
- E. The Mechanical Contractor shall review all wiring connections which have any influence on this equipment or work and verify that these connections are correct before permitting any equipment to be operated which is furnished, installed, or modified under this Contract.

### **3.12 ELECTRICAL EQUIPMENT ROOM PRECAUTIONS**

- A. Ductwork or piping for mechanical systems shall not be installed in any switchgear room, transformer vault, telephone room or electric closet except as indicated. In any case, no ductwork or piping for mechanical systems shall be installed in the space equal to the width and depth of any electrical service equipment, switchboards, panel boards, or motor control centers and extending from the floor to a height of six feet above the equipment or to the structural ceiling, whichever is lower.

### **3.13 CUTTING AND REPAIRING**

- A. No cutting shall be done except with approval. Cutting of structural members or footings is prohibited without the prior written consent of the structural engineer.
- B. Where cutting of paving, walls, ceilings, etc. is necessary for the installation of the mechanical work, it shall be done under the direction of this Section. Damage caused by this cutting shall be repaired to match original and adjacent surfaces without additional expense to the Owner. Cutting of new construction shall be by the installing Contractor of that construction as directed by this Contractor.

### **3.14 ACCESSIBILITY**

- A. General: Valves, damper operators, filters, thermometers, pressure gauges, clean-out fittings, and indicating equipment or specialties requiring reading, adjusting, inspection, repairing, removal, or replacement shall be conveniently and accessibly located with reference to finished building. Thermometers and gauges installed to be easily read from floor.
- B. Panels: No unions, flanges, valves, dampers, controls, or equipment shall be placed in a location that will be inaccessible after the system is complete. Access panels or doors shall be provided where required whether or not shown on Drawings.
- C. Access Panels in Walls or Ceilings:
  - 1. Provide access panels in walls or ceilings. Milcor or approved equal, where indicated and where required to provide access to valves, dampers, and other appurtenances. Panels shall be style as selected by and as directed by wall or ceiling construction. Panel size shall be 24" x 24" unless indicated otherwise. Panels in acoustical barriers shall have same transmission loss as barrier. Panels in rated construction shall have same rating as construction in which installed.
  - 2. Door panels shall be no lighter than 14 gauge steel. Doors shall be equipped with concealed spring hinges and flush, screwdriver operated locks, except that key operated locks shall be used for all access doors in walls where door is within 6'-0" of floor. Locks for all key operated doors shall be keyed alike.
  - 3. Doors in ceramic tile surfaces shall be stainless steel or chrome plated. Doors in other finished surfaces shall be prime coated.
  - 4. Doors in fire rated grease exhaust duct shafts shall be fire rated and openable without the use of tools.
- D. Equipment Spaces: Provide aisles between equipment and ducts, electrical gear, etc. for complete service and inspection of equipment. Maintain minimum 6'-6" headroom in all access aisles. Maintain minimum 36" clearance at all service panels. Provide minimum clearances at electrical equipment per NEC. Provide 36" wide, 3/4" thick plywood covered catwalks in attics from access door to equipment.

### **3.15 TESTING**

- A. Test all piping, ductwork, equipment, and systems as called for in the Specifications. Notify and inspection authorities prior to testing so that they may be witnessed. Protect all personnel and equipment during testing. Where Specifications do not cover specific points or methods, conform to manufacturer's specifications.

### **3.16 OPENINGS**

- A. Locating and sizing of all openings for pipe, conduit and ductwork through walls, roof, etc. shall be done under this Division. Framing of openings shall be done by the respective trades in

whose work the opening is made.

### **3.17 EQUIPMENT**

- A. Keep all openings closed with plugs or caps to prevent entrance of foreign matter. Protect all piping, ductwork, fixtures, and equipment against dirt, water, chemical, or mechanical damage both before and after installation. Any equipment or apparatus damaged prior to final acceptance shall be restored to original condition or replaced at the discretion and at no additional cost to the Owner.
- B. Start-Up: Equipment shall be adjusted, lubricated, aligned, etc. prior to start-up. Inspect each piece of equipment prior to start-up. Start each piece of equipment in accordance with manufacturer's directions and warranty requirements.
- C. Finish: Protect all equipment and materials until in use. Any visible rust or corrosion shall be removed as directed prior to installation. All damaged factory painted finishes shall be cleaned and painted with manufacturer provided paint.

### **3.18 MANUFACTURER'S DIRECTIONS**

- A. Materials and equipment shall be installed in accordance with manufacturer's application and recommendations, requirements, and instructions, and in accordance with Contract Documents. Where manufacturer's instructions differ from those indicated or specified, they shall be brought to attention for resolution prior to equipment ordering and installation.
- B. Where requirements indicated in Contract Documents exceed manufacturer's requirements, Contract Documents shall govern.

### **3.19 FURRING AND PIPE SPACES**

- A. Spaces provided in the design of the building shall be utilized and the work shall be kept within the furring lines established on the Drawings.
- B. Layout: Maintain maximum head room under piping and equipment. Contractor to coordinate line locations with beams, windows, etc. to provide maximum clearance. From Drawings, ascertain heights of suspended ceilings and size of pipe shafts in which piping is concealed, and location and size of structural members in and adjacent to pipe shafts. Coordinate piping installation with ductwork, lighting, and other equipment. Ensure necessary clearances on trim plates at exposed penetrations of walls and floors. If sufficient room is not available above suspended ceiling or vertical shafts obtain clarification from before work is started.

### **3.20 CLEAN-UP**

- A. During the course of work under this Section, all rubbish, debris, surplus materials, tools, etc. resulting from this work shall be removed from work area and shall be disposed of off-site at the end of each working day. The Owner's premises shall be left clean and in a condition acceptable to the owner.
- B. Clean all work installed under this Contract to satisfaction of Owner and submit documentation that each system has been cleaned and results witnessed by the representative.
- C. All water distribution and piping systems, including those for cold water and hot water systems, shall be flushed thoroughly until piping is cleaned to satisfaction of the owner. See other Specification Sections for additional requirements.

### **3.21 ENGRAVED NAMEPLATES**

- A. Furnish and install plastic laminated engraved nameplates with 1/4" minimum lettering at panel mounted control devices, manual control stations, power disconnects, motor starters and pieces of equipment. Nameplates exposed to weather shall be engraved brass.

### **3.22 FINAL INSPECTION**

- A. The Contractor shall furnish the certificates of final inspection and approval from the inspection authorities having jurisdiction.

### **3.23 SITE VISITS BY ENGINEER**

- A. Engineer's responsibility is limited to normal construction support services only, consisting of office consultation, site visits, and reports at appropriate stages of construction such as rough-

in, pre-final, and final.

- B. If the Engineer is requested for a site visit and the work performed to that point is not able to be reviewed, requiring an additional site visit, all costs incurred by the Engineer for additional site visits or office shall be paid for by that Contractor.

**END OF SECTION**

**SECTION 23 05 93**  
**TESTING, ADJUSTING, AND BALANCING FOR HVAC**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Testing, adjustment, and balancing of air systems.

**1.02 REFERENCE STANDARDS**

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems 2008, with Errata (2019).
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems 2015, with Errata (2017).
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing 2002.

**1.03 SUBMITTALS**

- A. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
  - 1. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
  - 2. Include at least the following in the plan:
    - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
    - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
    - c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
    - d. Final test report forms to be used.
    - e. Expected problems and solutions, etc.
    - f. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.
    - g. Procedures for formal deficiency reports, including scope, frequency and distribution.
- C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
  - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
  - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
  - 3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
  - 4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
  - 5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
  - 6. Include the following on the title page of each report:
    - a. Name of Testing, Adjusting, and Balancing Agency.
    - b. Address of Testing, Adjusting, and Balancing Agency.
    - c. Telephone number of Testing, Adjusting, and Balancing Agency.
    - d. Project name.
    - e. Project location.
    - f. Report date.

- D. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION**

### **3.01 GENERAL REQUIREMENTS**

- A. Perform total system balance in accordance with one of the following:
1. AABC (NSTSB), AABC National Standards for Total System Balance.
  2. SMACNA (TAB).
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
  2. Having minimum of three years documented experience.
  3. Certified by one of the following:
    - a. AABC, Associated Air Balance Council: [www.aabc.com/#sle](http://www.aabc.com/#sle); upon completion submit AABC National Performance Guaranty.
    - b. NEBB, National Environmental Balancing Bureau: [www.nebb.org/#sle](http://www.nebb.org/#sle).
    - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: [www.tabbcertified.org/#sle](http://www.tabbcertified.org/#sle).
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

### **3.02 EXAMINATION**

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
  2. Temperature control systems are installed complete and operable.
  3. Proper thermal overload protection is in place for electrical equipment.
  4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  5. Duct systems are clean of debris.
  6. Fans are rotating correctly.
  7. Fire and volume dampers are in place and open.
  8. Air coil fins are cleaned and combed.
  9. Access doors are closed and duct end caps are in place.
  10. Air outlets are installed and connected.
  11. Duct system leakage is minimized.
- B. Beginning of work means acceptance of existing conditions.

### **3.03 PREPARATION**

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

### **3.04 ADJUSTMENT TOLERANCES**

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 5 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

### **3.05 RECORDING AND ADJUSTING**

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- F. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

**END OF SECTION**



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**SECTION 23 07 13  
DUCT INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Duct insulation.
- B. Duct liner.
- C. Weather barrier coatings.
- D. Jacketing and accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 23 31 00 - HVAC Ducts and Casings: Glass fiber ducts.

**1.03 REFERENCE STANDARDS**

- A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2021a.
- B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2021.
- C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2023.
- D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).
- E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation 2014 (Reapproved 2019).
- F. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation 2020.
- G. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material) 2019.
- H. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation 2021.
- I. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts 2016 (Reapproved 2021).
- J. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings 2019 (Reapproved 2022).
- K. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers 2015.
- L. ASTM C1410 - Standard Specification for Cellular Melamine Thermal and Sound-Absorbing Insulation 2017.
- M. ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation 2021.
- N. ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay 2017 (Reapproved 2021).
- O. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.
- P. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a.
- Q. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015, with Editorial Revision (2021).
- R. SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth 2016b.

- S. UL 181A - Closure Systems for Use with Rigid Air Ducts Current Edition, Including All Revisions.
- T. UL 181B - Closure Systems for Use with Flexible Air Ducts and Air Connectors Current Edition, Including All Revisions.
- U. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

#### **1.07 FIELD CONDITIONS**

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

### **PART 2 PRODUCTS**

#### **2.01 REGULATORY REQUIREMENTS**

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

#### **2.02 GLASS FIBER, FLEXIBLE**

- A. Manufacturer:
  - 1. CertainTeed Corporation.
  - 2. Johns Manville.
  - 3. JP Lamborn Co; Thermal Sleeve MT.
  - 4. Knauf Insulation; Atmosphere Duct Wrap.
  - 5. Owens Corning Corporation.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
  - 1. K (Ksi) value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 1,200 degrees F (649 degrees C).
  - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
  - 3. Secure with pressure-sensitive tape.
- D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.
- E. Indoor Vapor Barrier Mastic:
  1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- F. Outdoor Vapor Barrier Mastic:
  1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- G. Tie Wire: Annealed steel, 16 gauge, 0.0508 inch diameter (1.29 mm diameter).

## **2.03 GLASS FIBER, RIGID**

- A. Manufacturer:
  1. CertainTeed Corporation.
  2. Johns Manville.
  3. Knauf Insulation.
  4. Owens Corning Corporation; 700 Series FIBERGLAS Insulation.
- B. Insulation: ASTM C612; rigid, noncombustible blanket.
  1. K (Ksi) Value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C518.
  2. Maximum Service Temperature: 450 degrees F (232 degrees C).
  3. Maximum Water Vapor Absorption: 5.0 percent.
  4. Maximum Density: 8.0 pcf (128 kg/cu m).
- C. Vapor Barrier Jacket:
  1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
  3. Secure with pressure-sensitive tape.
- D. Vapor Barrier Tape:
  1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.
- E. Indoor Vapor Barrier Finish:
  1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight, glass fabric.
  2. Vinyl emulsion type acrylic, compatible with insulation, black color.

## **2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION**

- A. Manufacturers:
  1. Aeroflex USA, Inc; Aerocel Sheet and Roll with PSA.
  2. Armacell LLC; ArmaFlex Ultra with FlameDefense.
  3. K-Flex USA LLC; Insul-Sheet.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
  1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
  2. Maximum Service Temperature: 180 degrees F (82 degrees C).
  3. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.
- D. Weather Barrier Coating: Air dried, contact adhesive, compatible with insulation and ASTM E84 compliant.
  1. Manufacturers:
    - a. Design Polymerics; DP 5050 Water Based, Zero VOC, High Strength, Weather Barrier Coating.
    - b. Vimasco Corporation.

## **2.05 WEATHER BARRIER COATINGS**

- A. Weather-Resistive Barrier Coating: Fire-resistive, UV resistant, water-based mastic for use over closed cell polyethylene and polyurethane foam insulation; applied with glass fiber or

synthetic reinforcing mesh.

1. Manufacturers:
  - a. H.B. Fuller Construction Products, Inc; Childers - CP Series Weather Barrier Coating.
2. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A, when tested in accordance with ASTM E84.
3. Water Vapor Permeance: Greater than 1.0 perm (57 ng/(Pa s m)) in accordance with ASTM E96/E96M.
4. Resistance to Fungal Growth: No growth when tested in accordance with ASTM D5590.
5. Color: As selected by Architect.

## **2.06 JACKETING AND ACCESSORIES**

- A. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire-retardant lagging adhesive.
  1. Lagging Adhesive:
    - a. Compatible with insulation.
- B. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square (2.45 kg/sq m).
- C. Aluminum Jacket:
  1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch (0.41 mm) with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
  2. Thickness: 0.016 inch (0.40 mm) sheet.
  3. Finish: Smooth.
  4. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
  5. Fittings: 0.016 inch (0.40 mm) thick die-shaped fitting covers with factory-attached protective liner.
  6. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.
- D. Flexible Weather-Proofing Outdoor Jacket: Self-healing, field-applied outdoor cladding.
  1. Material: Aluminum foil/polymer laminate with rubberized asphalt layer and acrylic adhesive.
  2. Thickness: 34 mil, 0.034 inch (0.86 mm).
  3. Finish: Embossed.
  4. Color: Silver.
  5. Water Vapor Transmission: 0.002 perm inch (0.0029 ng/(Pa s m)), maximum, when tested in accordance with ASTM E96/E96M.
  6. Mold Resistance: Pass when tested in accordance with ASTM C1338.
  7. Emissivity: 0.30 when tested in accordance with ASTM C1371.
  8. Manufacturers:
    - a. Polyguard Products; Alumaguard.
- E. Reinforced Tape:
  1. Manufacturers:
    - a. Ideal Tape Co., Inc.
  2. FSK tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.
  3. Comply with UL 723 or ASTM E84.
  4. Moisture Vapor Permeability: 0.00 perm inch (0.00 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
  5. Finish: Match insulation.
- F. UL181 Tape for Rigid and Flexible Ductwork:
  1. Manufacturers:
    - a. Ideal Tape Co., Inc.
  2. Comply with UL 181A for rigid ductwork.
  3. Comply with UL 181B for flexible ductwork.
  4. Aluminum foil coated with pressure-sensitive adhesive on paper release liner.

5. Foil tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.

## **2.07 DUCT LINER**

- A. Manufacturers:
  1. Armacell LLC; ArmaFlex Ultra with FlameDefense: [www.armacell.us/#sle](http://www.armacell.us/#sle).
  2. CertainTeed Corporation.
  3. Ductmate Industries, Inc, a DMI Company.
  4. Johns Manville.
  5. Knauf Insulation.
  6. Owens Corning Corporation; QuietR Rotary Duct Insulation.
- B. Elastomeric Foam Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
  1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
  2. Maximum Service Temperature: 180 degrees F (82 degrees C).
  3. Fungal Resistance: No growth when tested according to ASTM G21.
  4. Apparent Thermal Conductivity: Maximum of 0.28 at 75 degrees F (0.045 at 24 degrees C).
  5. Erosion Resistance: Does not show evidence of breaking away, flaking off, or delamination at velocities of 10,000 fpm (50.8 m/s) when tested in accordance with ASTM C1071.
  6. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation. Comply with ASTM C916.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Insulated Ducts Conveying Air Below Ambient Temperature:
  1. Provide insulation with vapor barrier jackets.
  2. Finish with tape and vapor barrier jacket.
  3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- C. Insulated Ducts Conveying Air Above Ambient Temperature:
  1. Provide with or without standard vapor barrier jacket.
  2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- D. Exterior Applications: Provide insulation with vapor barrier jacket.
- E. External Duct Insulation Application:
  1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
  2. Secure insulation without vapor barrier with staples, tape, or wires.
  3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
  4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
  5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- F. Duct and Plenum Liner Application:

1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for air-flow, unless noted otherwise. Increase duct size to allow for insulation thickness.

**END OF SECTION**

**SECTION 23 31 00  
HVAC DUCTS AND CASINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metal ducts.
- B. Flexible ducts.
- C. Nonmetal ducts.
- D. Air plenums and casings

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 23 07 13 - Duct Insulation: External insulation and duct liner.
- C. Section 23 33 00 - Air Duct Accessories.

**1.03 REFERENCE STANDARDS**

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- E. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2021a.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.
- G. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements 2015.
- H. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements 2015.
- I. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements 2015.
- J. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements 2016.
- K. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2021.
- L. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems 2021.
- M. NFPA 91 - Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids 2020.
- N. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations 2021.
- O. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2021.
- P. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual 2012.
- Q. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors current edition, including all revisions.
- R. UL 1978 - Grease Ducts Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. Product Data: Provide data for duct materials.



- B. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate per appropriate seal class, following SMACNA (LEAK).
- C. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience.

#### **1.06 FIELD CONDITIONS**

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

### **PART 2 PRODUCTS**

#### **2.01 GENERAL REQUIREMENTS**

- A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.
- B. Provide metal duct unless otherwise indicated.
- C. Duct Shape and Material in accordance with Allowed Static Pressure Range:
  - 1. Round: Plus or minus 2 in-wc (500 Pa) of galvanized steel.
  - 2. Rectangular: Plus or minus 1/2 in-wc (125 Pa) of galvanized steel.
  - 3. Flat Oval: Plus 2 in-wc (500 Pa) of galvanized steel.
- D. Duct Sealing and Leakage in accordance with Static Pressure Class:
  - 1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:
    - a. Supply Air: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
    - b. Outside Air Intake: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
    - c. Return and Relief Air: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
    - d. General Exhaust Air: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
- E. Duct Fabrication Requirements:
  - 1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings. Minimum thickness shall be 26 gauge.
  - 2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
  - 3. Construct tee's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
  - 4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
  - 5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
  - 6. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

#### **2.02 METAL DUCTS**

- A. Material Requirements:
  - 1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
  - 2. Aluminum: ASTM B209/B209M, aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.

3. Stainless Steel: ASTM A666, Type 304.
- B. Flat-Oval Metal Ducts:
  1. Flat-Oval Single Wall Duct: Machine made from a round spiral lock seam duct.
    - a. Fittings: Manufacture at least two gauges heavier metal than the duct.
    - b. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.
- C. Round Metal Ducts:
  1. Round Single Wall Duct: Round lock seam duct with galvanized steel outer wall.
  2. Round Connection System: Interlocking duct connection system per SMACNA (DCS).
- D. Round Spiral Duct:
  1. Round spiral lock seam duct with galvanized steel outer wall.
- E. Connectors, Fittings, Sealants, and Miscellaneous:
  1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
  2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
  3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
    - a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
    - b. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
    - c. For Use with Flexible Ducts: UL labeled.
  4. Gasket Tape:
    - a. Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle ring connections.
  5. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
  6. Hanger Fasteners: Attach hangers to structure using appropriate fasteners as follows:
    - a. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
    - b. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
    - c. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
    - d. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
    - e. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
- F. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form a spiral helix.
  1. Pressure Rating: 10 in-wc (2.50 kPa) positive and 5 in-wc (1.25 kPa) negative.
  2. Maximum Velocity: 4000 fpm (20.3 m/sec).
  3. Temperature Range: Minus 20 degrees F to 250 degrees F (Minus 28 degrees C to 121 degrees C).

## 2.03 FLEXIBLE DUCTS

- A. Flexible Air Ducts:
  1. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
  2. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
  3. Pressure Rating: From 10 in-wc (2.5 kPa) to 1 in-wc (250 Pa) negative.
  4. Temperature Range: Minus 20 to 210 degrees F (Minus 28 to 99 degrees C).

## 2.04 AIR PLENUMS AND CASINGS

- A. Fabricate in accordance with SMACNA (DCS) for indicated operating pressures indicated.
- B. Minimum Fabrication Requirements:
  1. Fabricate acoustic plenum or casing with reinforcing turned inward.

2. Provide 16 gauge, 0.059 inch (1.52 mm) sheet steel back facing and 22 gauge, 0.029 inch (0.76 mm) perforated sheet steel front facing with 3/32 inch (2.4 mm) diameter holes on 5/32 inch (4 mm) centers.
  3. Construct panels 3 inches (75 mm) thick packed with 4.5 pcf (72 kg/cu m) minimum glass fiber insulation media, on inverted channels of 16 gauge, 0.059 inch (1.52 mm) sheet steel.
  4. Mount floor mounted plenum or casings on 4 inch (100 mm) high concrete curbs. At floor, rivet panels on 8 inch (200 mm) centers to angles. Where floors are acoustically insulated, provide liner of galvanized 18 gauge, 0.052 inch (1.31 mm) expanded metal mesh supported at 12 inch (300 mm) centers, turned up 12 inches (300 mm) at sides with sheet metal shields.
- C. Access Doors:
1. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
  2. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles.
  3. Provide clear wire glass observation ports, minimum 6 by 6 inch (150 by 150 mm) size.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install products following the manufacturer's instructions.
- C. Comply with safety standards NFPA 90A and NFPA 90B.
- D. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.
- E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- F. Flexible Ducts: Connect to metal ducts with adhesive.
- G. Duct sizes indicated are inside precise dimensions, unless noted otherwise. For lined ducts, maintain sizes inside lining.
- H. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- I. Use crimp joints with or without bead for joining round duct sizes 8 inch (200 mm) and smaller with a crimp in the direction of airflow.
- J. Use double nuts and lock washers on threaded rod supports.
- K. Connect terminal units to supply ducts directly or with one foot (300 mm) maximum length of flexible duct. Do not use a flexible duct to change direction.
- L. Connect diffusers or light troffer boots to low-pressure ducts directly or with 5 feet (1.5 m) maximum length of flexible duct held in place with strap or clamp.
- M. At exterior wall louvers, seal duct to louver frame and install blank-out panels.
- N. Fire Partitions: Provide firestopping sealing.
- O. Duct Insulation: Provide duct insulation in compliance with Section 23 07 13.

#### **3.02 CLEANING**

- A. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters or bypass during cleaning. Provide adequate access to the ductwork for cleaning purposes.

**END OF SECTION**

**SECTION 23 33 00  
AIR DUCT ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Backdraft dampers - metal.
- B. Combination fire and smoke dampers.
- C. Duct access doors.
- D. Duct test holes.
- E. Fire dampers.
- F. Flexible duct connectors.
- G. Smoke dampers.
- H. Volume control dampers.

**1.02 RELATED REQUIREMENTS**

- A. Section 23 31 00 - HVAC Ducts and Casings.

**1.03 REFERENCE STANDARDS**

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2021.
- B. NFPA 92 - Standard for Smoke Control Systems 2021.
- C. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations 2021.
- D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2021.
- E. UL 33 - Safety Heat Responsive Links for Fire-Protection Service Current Edition, Including All Revisions.
- F. UL 555 - Standard for Fire Dampers Current Edition, Including All Revisions.
- G. UL 555C - Standard for Safety Ceiling Dampers Current Edition, Including All Revisions.
- H. UL 555S - Standard for Smoke Dampers Current Edition, Including All Revisions.
- I. UL 1978 - Grease Ducts Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, and duct test holes. Include electrical characteristics and connection requirements.
- B. Manufacturer's Installation Instructions: Provide instructions for fire dampers and combination fire and smoke dampers.
- C. Project Record Drawings: Record actual locations of access doors and test holes.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Fusible Links: Two of each type and size.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Protect dampers from damage to operating linkages and blades.

## **PART 2 PRODUCTS**

### **2.01 BACKDRAFT DAMPERS - METAL**

- A. Manufacturers:
  - 1. Nailor Industries, Inc
  - 2. Ruskin Company
  - 3. Greenheck
  - 4. Pottorff
- B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch (150 mm) width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

### **2.02 COMBINATION FIRE AND SMOKE DAMPERS**

- A. Manufacturers:
  - 1. Nailor Industries, Inc
  - 2. NCA, a brand of Metal Industries Inc
  - 3. Pottorff
  - 4. Ruskin Company
  - 5. Greenheck
- B. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.
- C. Provide factory sleeve and collar for each damper.
- D. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch (12.7 mm) actuator shaft.
- E. Operators: UL listed and labeled spring return electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on interior of duct and link to damper operating shaft.
- F. Normally Closed Smoke Responsive Fire Dampers: Curtain type, opening by gravity upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure.
- G. Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

### **2.03 DUCT ACCESS DOORS**

- A. Manufacturers:
  - 1. Ductmate Industries, Inc, a DMI Company
  - 2. Nailor Industries, Inc
  - 3. Ruskin Company
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Access doors with sheet metal screw fasteners are not acceptable.

### **2.04 DUCT TEST HOLES**

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

### **2.05 FIRE DAMPERS**

- A. Manufacturers:
  - 1. Nailor Industries, Inc
  - 2. NCA, a brand of Metal Industries Inc
  - 3. Pottorff
  - 4. Ruskin Company

- 5. Greenheck
- B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- C. Ceiling (Radiation) Dampers: Galvanized steel, 22 gauge, 0.0299 inch (0.76 mm) frame and 16 gauge, 0.0598 inch (1.52 mm) flap, two layers 0.125 inch (3.2 mm) ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.
  - 1. Rated for three hour service in compliance with UL 555C.
- D. Horizontal Dampers: Galvanized steel, 22 gauge, 0.0299 inch (0.76 mm) frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.
- E. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1.0 inch (250 Pa) pressure class ducts up to 12 inches (300 mm) in height.
- F. Multiple Blade Dampers: 16 gauge, 0.0598 inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
- G. Fusible Links: UL 33, separate at 160 degrees F (71 degrees C) with adjustable link straps for combination fire/balancing dampers.

## **2.06 FLEXIBLE DUCT CONNECTORS**

- A. Manufacturers:
  - 1. Ductmate Industries, Inc, a DMI Company
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Flexible Duct Connections: Fabric crimped into metal edging strip.
  - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz/sq yd (1.0 kg/sq m).
- D. Maximum Installed Length: 14 inch (356 mm).

## **2.07 SMOKE DAMPERS**

- A. Manufacturers:
  - 1. Nailor Industries, Inc
  - 2. NCA, a brand of Metal Industries Inc
  - 3. Ruskin Company
  - 4. Greenheck
- B. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.
- C. Dampers: UL Class 1 airfoil blade type smoke damper, normally open automatically operated by electric actuator.
- D. Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

## **2.08 VOLUME CONTROL DAMPERS**

- A. Manufacturers:
  - 1. Nailor Industries, Inc
  - 2. Ruskin Company
  - 3. Greenheck
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Single Blade Dampers:
  - 1. Fabricate for duct sizes up to 6 by 30 inch (150 by 760 mm).
  - 2. Blade: 24 gauge, 0.0239 inch (0.61 mm), minimum.
- D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch (200 by 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

1. Blade: 18 gauge, 0.0478 inch (1.21 mm), minimum.
- E. End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

### **PART 3 EXECUTION**

#### **3.01 PREPARATION**

- A. Verify that electric power is available and of the correct characteristics.

#### **3.02 INSTALLATION**

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 31 00 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96 Provide minimum 8 by 8 inch (200 by 200 mm) size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch (100 by 100 mm) for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.
- G. Demonstrate re-setting of fire dampers to Owner's representative.
- H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- J. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- K. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

#### **END OF SECTION**

**SECTION 26 05 19**  
**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Metal-clad cable.
- C. Wiring connectors.
- D. Electrical tape.
- E. Heat shrink tubing.
- F. Oxide inhibiting compound.
- G. Wire pulling lubricant.
- H. Cable ties.
- I. Firestop sleeves.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 21 00 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.

**1.03 REFERENCE STANDARDS**

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes 2020.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- H. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable 2018.
- I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2021.
- J. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- K. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.
- M. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.



- N. UL 267 - Outline of Investigation for Wire-Pulling Compounds Most Recent Edition, Including All Revisions.
- O. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.
- P. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.
- Q. UL 486D - Sealed Wire Connector Systems Current Edition, Including All Revisions.
- R. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.
- S. UL 1569 - Metal-Clad Cables Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
  - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

#### **1.07 FIELD CONDITIONS**

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

### **PART 2 PRODUCTS**

#### **2.01 CONDUCTOR AND CABLE APPLICATIONS**

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

#### **2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductor Material:
  - 1. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
  - 2. Tinned Copper Conductors: Comply with ASTM B33.
- H. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
3. Color Code:
  - a. Equipment Ground, All Systems: Green.

### **2.03 SINGLE CONDUCTOR BUILDING WIRE**

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
  1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Solid.
    - b. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
  1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

### **2.04 METAL-CLAD CABLE**

- A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- B. Conductor Stranding:
  1. Size 10 AWG and Smaller: Solid.
  2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- E. Grounding: Full-size integral equipment grounding conductor.
- F. Armor: Steel, interlocked tape.

### **2.05 WIRING CONNECTORS**

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

### **2.06 ACCESSORIES**

- A. Electrical Tape:
  1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
- D. Wire Pulling Lubricant:
  1. Listed and labeled as complying with UL 267.
  2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.

- 3. Suitable for use at installation temperature.
- E. Cable Ties: Material and tensile strength rating suitable for application.
- F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

### **3.03 INSTALLATION**

- A. Circuiting Requirements:
  - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
  - 2. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
  - 3. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
  - 4. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install metal-clad cable (Type MC) in accordance with NECA 120.
- E. Installation in Raceway:
  - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  - 2. Pull all conductors and cables together into raceway at same time.
  - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- H. Terminate cables using suitable fittings.
  - 1. Metal-Clad Cable (Type MC):
    - a. Use listed fittings.
    - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

- I. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- L. Make wiring connections using specified wiring connectors.
  - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  - 3. Do not remove conductor strands to facilitate insertion into connector.
  - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
- M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- N. Insulate ends of spare conductors using vinyl insulating electrical tape.
- O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- P. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

#### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

**END OF SECTION**

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**SECTION 26 05 26**  
**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 26 05 36 - Cable Trays for Electrical Systems: Additional grounding and bonding requirements for cable tray systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Verify exact locations of underground metal water service pipe entrances to building.
  - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.

**1.05 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

**2.01 GROUNDING AND BONDING REQUIREMENTS**

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Bonding and Equipment Grounding:
  - 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and

- other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Raceways may be used as sole equipment grounding conductor where permitted by NFPA 70. Provide insulated equipment grounding conductor where indicated or required, including but not limited to:
    - a. In each nonmetallic feeder and branch circuit raceway.
    - b. In each flexible conduit.
    - c. In outdoor portions of each metallic feeder and branch circuit raceway utilizing non-threaded fittings (where permitted) supplying rooftop multimotor and combination-load air-conditioning and refrigerating equipment.
  3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
  4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
  5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
  6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
  7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
- F. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
  2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
    - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
    - b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
    - c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.

## **2.02 GROUNDING AND BONDING COMPONENTS**

- A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
  2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
1. Use insulated copper conductors unless otherwise indicated.
    - a. Exceptions:
      - 1) Use bare copper conductors where installed underground in direct contact with earth.
      - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
  2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
  3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
- D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
  2. Size: As indicated.
  3. Holes for Connections: As indicated or as required for connections to be made.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Make grounding and bonding connections using specified connectors.
  - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
  - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  - 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- D. Identify grounding and bonding system components in accordance with Section 26 05 53.

#### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

**END OF SECTION**



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**SECTION 26 05 29  
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- C. Section 26 05 36 - Cable Trays for Electrical Systems: Additional support and attachment requirements for cable tray.
- D. Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- E. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
- F. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.
- G. Section 26 56 00 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.
- H. Section 27 05 29 - Hangers and Supports for Communications Systems.

**1.03 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.
- D. MFMA-4 - Metal Framing Standards Publication 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
  - 2. Coordinate work to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
  - 4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
  - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 30 00.

### **1.05 QUALITY ASSURANCE**

- A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

## **PART 2 PRODUCTS**

### **2.01 SUPPORT AND ATTACHMENT COMPONENTS**

- A. General Requirements:
  - 1. Comply with the following. Where requirements differ, comply with most stringent.
    - a. NFPA 70.
    - b. Requirements of authorities having jurisdiction.
  - 2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
  - 3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
  - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
  - 5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
  - 6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
    - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
  - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
  - 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
- D. Metal Channel/Strut Framing Systems:
  - 1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
  - 2. Comply with MFMA-4.
- E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
- F. Anchors and Fasteners:
  - 1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install hangers and supports in accordance with NECA 1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
  - 1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
  - 2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Secure fasteners in accordance with manufacturer's recommended torque settings.
- I. Remove temporary supports.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

**END OF SECTION**

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**SECTION 26 05 33.13**  
**CONDUIT FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Galvanized steel rigid metal conduit (RMC).
- B. Aluminum rigid metal conduit (RMC).
- C. Galvanized steel intermediate metal conduit (IMC).
- D. PVC-coated galvanized steel rigid metal conduit (RMC).
- E. Flexible metal conduit (FMC).
- F. Liquidtight flexible metal conduit (LFMC).
- G. Galvanized steel electrical metallic tubing (EMT).
- H. Aluminum electrical metallic tubing (EMT).
- I. Rigid polyvinyl chloride (PVC) conduit.
- J. Electrical nonmetallic tubing (ENT).
- K. Liquidtight flexible nonmetallic conduit (LFNC).

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 33.16 - Boxes for Electrical Systems.
- E. Section 26 05 33.23 - Surface Raceways for Electrical Systems.
- F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- G. Section 27 05 33.13 - Conduit for Communications Systems.

**1.03 REFERENCE STANDARDS**

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2020.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2020.
- E. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2017.
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- G. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit 2020.
- H. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing 2021.
- I. NEMA TC 13 - Electrical Nonmetallic Tubing (ENT) 2014 (Reaffirmed 2019).
- J. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 1 - Flexible Metal Conduit Current Edition, Including All Revisions.
- L. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.
- M. UL 360 - Liquid-Tight Flexible Metal Conduit Current Edition, Including All Revisions.
- N. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.

- O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings Current Edition, Including All Revisions.
- P. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.
- Q. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel Current Edition, Including All Revisions.
- R. UL 1653 - Electrical Nonmetallic Tubing Current Edition, Including All Revisions.
- S. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit Current Edition, Including All Revisions.
- T. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
  - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
  - 4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
  - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

#### **1.05 QUALITY ASSURANCE**

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 CONDUIT APPLICATIONS**

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
  - 1. Under Slab on Grade: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
  - 2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
  - 3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel

- electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
4. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or schedule 80 rigid PVC conduit where emerging from underground.
  5. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows, stainless steel rigid metal conduit (RMC) elbows, galvanized steel intermediate metal conduit (IMC) elbows, stainless steel intermediate metal conduit (IMC) elbows, PVC-coated galvanized steel rigid metal conduit (RMC) elbows, or concrete-encased PVC elbows for bends.
  6. Where galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) is installed in direct contact with earth where soil has resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
  7. Where galvanized steel electrical metallic tubing (EMT) is installed in direct contact with earth, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
  8. Where aluminum rigid metal conduit (RMC) or aluminum electrical metallic tubing (EMT) is installed in direct contact with earth, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
  9. Where galvanized rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT) emerges from concrete into soil, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection for minimum of 4 inches (100 mm) on either side of where conduit emerges.
- D. Embedded Within Concrete:
1. Within Slab on Grade: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC). Embed within structural slabs only where approved by Structural Engineer.
  2. Within Slab Above Ground: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC). Embed within structural slabs only where approved by Structural Engineer.
  3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
  4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT) where emerging from concrete.
  5. Where galvanized steel electrical metallic tubing (EMT) emerges from concrete into salt air, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to



- provide supplementary corrosion protection for minimum of 4 inches (100 mm) on either side of where conduit emerges.
6. Where aluminum rigid metal conduit (RMC) and aluminum electrical metallic tubing (EMT) is installed in concrete, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.
- E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- K. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- L. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or stainless steel intermediate metal conduit (IMC).
- M. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- N. Corrosive Locations Above Ground: Use stainless steel rigid metal conduit (RMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), stainless steel electrical metallic tubing (EMT), or reinforced thermosetting resin conduit (RTRC).
- O. Hazardous/Classified Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit (RMC).
- P. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).
- Q. Flexible Connections to Vibrating Equipment:

## **2.02 CONDUIT - GENERAL REQUIREMENTS**

- A. Comply with NFPA 70.
- B. Provide conduit, fittings, supports, and accessories required for complete raceway system.
- C. Provide products listed, classified, and labeled as suitable for purpose intended.
- D. Minimum Conduit Size, Unless Otherwise Indicated:
  - 1. Branch Circuits: 3/4-inch (21 mm) trade size.
  - 2. Branch Circuit Homeruns: 3/4-inch (21 mm) trade size.
- E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

## **2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
  - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
  - 2. Material: Use steel or malleable iron.
  - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

## **2.04 FLEXIBLE METAL CONDUIT (FMC)**

- A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.

## **2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)**

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.

## **2.06 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.
  - 3. Connectors and Couplings: Use compression/gland or set-screw type.
    - a. Do not use indenter type connectors and couplings.
  - 4. Embedded Within Concrete, Where Permitted: Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

## **2.07 ALUMINUM ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: NFPA 70, Type EMT aluminum electrical metallic tubing listed and labeled as complying with UL 797A.
- B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; listed for use with aluminum EMT.
2. Material: Use aluminum.
3. Connectors and Couplings: Use compression/gland or set-screw type.
  - a. Do not use indenter type connectors and couplings.

## **2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT**

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- B. Fittings:
  1. Manufacturer: Same as manufacturer of conduit to be connected.
  2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

## **2.09 ELECTRICAL NONMETALLIC TUBING (ENT)**

- A. Description: NFPA 70, Type ENT electrical nonmetallic tubing complying with NEMA TC 13 and listed and labeled as complying with UL 1653.
- B. Fittings:
  1. Manufacturer: Same as manufacturer of ENT to be connected.
  2. Use solvent-welded type fittings.
  3. Solvent-Welded Fittings: Rigid PVC fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; suitable for use with ENT.

## **2.10 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)**

- A. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.
- B. Fittings:
  1. Manufacturer: Same as manufacturer of conduit to be connected.
  2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for type of conduit to be connected.

## **2.11 ACCESSORIES**

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch (0.51 mm).
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).
- E. Foam Conduit Sealant:
  1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.
  2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
  3. Rated to hold minimum of 10 ft (3.0 m) water head pressure.
- F. Conduit Mechanical Seals:
  1. Listed as complying with UL 514B.
  2. Specifically designed for sealing conduit openings against water, moisture, gases, and dust.
  3. Suitable for sealing around conductors/cables to be installed.
- G. Sealing Compound for Hazardous/Classified Location Sealing Fittings: Listed for use with particular fittings to be installed.

- H. Sealing Systems for Concrete Penetrations:
  - 1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
  - 2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.
- I. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- J. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- E. Install electrical nonmetallic tubing (ENT) in accordance with NECA 111.
- F. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.
- G. Conduit Support:
  - 1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 05 29.
  - 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- H. Connections and Terminations:
  - 1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
  - 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
  - 3. Use suitable adapters where required to transition from one type of conduit to another.
  - 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
  - 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
  - 6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
  - 7. Secure joints and connections to provide mechanical strength and electrical continuity.
- I. Penetrations:
  - 1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
  - 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
  - 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
  - 4. Conceal bends for conduit risers emerging above ground.
  - 5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
  7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 84 00.
- J. Underground Installation:
1. Minimum Cover, Unless Otherwise Indicated or Required:
- K. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.
- L. Provide grounding and bonding; see Section 26 05 26.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective conduits.

### **3.04 CLEANING**

- A. Clean interior of conduits to remove moisture and foreign matter.

### **3.05 PROTECTION**

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

**END OF SECTION**

**SECTION 26 05 33.16**  
**BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).
- C. Boxes and enclosures for integrated power, data, and audio/video.
- D. Boxes for hazardous (classified) locations.
- E. Floor boxes.
- F. Underground boxes/enclosures.
- G. Accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 33.13 - Conduit for Electrical Systems:
  - 1. Conduit bodies and other fittings.
  - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- E. Section 26 27 26 - Wiring Devices:
  - 1. Wall plates.
  - 2. Floor box service fittings.
  - 3. Poke-through assemblies.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013 (Reaffirmed 2020).
- F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. SCTE 77 - Specifications for Underground Enclosure Integrity 2017.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- J. UL 508A - Industrial Control Panels Current Edition, Including All Revisions.
- K. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.
- L. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
  - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
  - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
  - 6. Coordinate the work with other trades to preserve insulation integrity.
  - 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
  - 8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 BOXES**

- A. General Requirements:
  - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
  - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
  - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
  - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
  - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  - 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
  - 3. Use suitable concrete type boxes where flush-mounted in concrete.
  - 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
  - 5. Use raised covers suitable for the type of wall construction and device configuration where required.
  - 6. Use shallow boxes where required by the type of wall construction.
  - 7. Do not use "through-wall" boxes designed for access from both sides of wall.
  - 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  - 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  - 10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.

11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Wall Plates: Comply with Section 26 27 26.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
  1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
  3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
  4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
  5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
- D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
- E. Boxes for Hazardous (Classified) Locations: Listed and labeled as complying with UL 1203 for the classification of the installed location.
- F. Floor Boxes:
  1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 27 26; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
  2. Manufacturer: Same as manufacturer of floor box service fittings.
- G. Underground Boxes/Enclosures:
  1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
  2. Size: As indicated on drawings.
  3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
  4. Applications:
    - a. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
  5. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
    - a. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.



- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Box Locations:
  - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
  - 2. Unless dimensioned, box locations indicated are approximate.
  - 3. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
  - 4. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) horizontal separation.
  - 5. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
    - a. Do not install flush-mounted boxes with area larger than 16 square inches (0.0103 sq m) or such that the total aggregate area of openings exceeds 100 square inches (0.0645 sq m) for any 100 square feet (9.29 sq m) of wall area.
  - 6. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.
- I. Box Supports:
  - 1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
  - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
  - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
  - 4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- J. Install boxes plumb and level.
- K. Flush-Mounted Boxes:
  - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
  - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
  - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- L. Install boxes as required to preserve insulation integrity.
- M. Underground Boxes/Enclosures:
  - 1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.
  - 2. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
- N. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- P. Close unused box openings.
- Q. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- R. Provide grounding and bonding in accordance with Section 26 05 26.

**3.03 CLEANING**

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

**3.04 PROTECTION**

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

**END OF SECTION**

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**SECTION 26 05 33.23**  
**SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surface raceway systems.
- B. Wireways.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
  - 1. Includes metal channel (strut) used as raceway.
- C. Section 26 05 33.13 - Conduit for Electrical Systems.
- D. Section 26 05 33.16 - Boxes for Electrical Systems.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 27 26 - Wiring Devices: Receptacles.
- G. Section 27 10 00 - Structured Cabling: Voice and data jacks.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 5 - Surface Metal Raceways and Fittings Current Edition, Including All Revisions.
- D. UL 5A - Nonmetallic Surface Raceways and Fittings Current Edition, Including All Revisions.
- E. UL 111 - Outline of Investigation for Multioutlet Assemblies Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the placement of raceways with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate rough-in locations of outlet boxes provided under Section 26 05 33.16 and conduit provided under Section 26 05 33.13 as required for installation of raceways provided under this section.
  - 3. Verify minimum sizes of raceways with the actual conductors and components to be installed.
  - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install raceways until final surface finishes and painting are complete.
  - 2. Do not begin installation of conductors and cables until installation of raceways is complete between outlet, junction and splicing points.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including dimensions, knockout sizes and locations, materials, fabrication details, finishes, service condition requirements, and accessories.
  - 1. Surface Raceway Systems: Include information on fill capacities for conductors and cables.

- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 RACEWAY REQUIREMENTS**

- A. Provide all components, fittings, supports, and accessories required for a complete raceway system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

#### **2.02 SURFACE RACEWAY SYSTEMS**

- A. Manufacturers:
  - 1. Wiremold, a brand of Legrand North America, Inc; [\_\_\_\_\_]: [www.legrand.us/#sle](http://www.legrand.us/#sle).
- B. Surface Metal Raceways: Listed and labeled as complying with UL 5.
- C. Surface Nonmetallic Raceways: Listed and labeled as complying with UL 5A.
- D. Multioutlet Assemblies: Listed and labeled as complying with UL 111.
- E. Metal Channel (Strut) Used as Raceway: Comply with Section 26 05 29.

#### **2.03 SOURCE QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes and conduit terminations are installed in proper locations and are properly sized in accordance with NFPA 70 to accommodate raceways.
- C. Verify that mounting surfaces are ready to receive raceways and that final surface finishes are complete, including painting.
- D. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install raceways plumb and level.
- D. Secure and support raceways in accordance with Section 26 05 29 at intervals complying with NFPA 70 and manufacturer's requirements.
- E. Close unused raceway openings.
- F. Provide grounding and bonding in accordance with Section 26 05 26.

**3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect raceways for damage and defects.
- C. Correct wiring deficiencies and replace damaged or defective raceways.

**3.04 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**3.05 PROTECTION**

- A. Protect installed raceways from subsequent construction operations.

**END OF SECTION**

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**SECTION 26 05 36**  
**CABLE TRAYS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metal cable tray systems:
  - 1. Metal wire mesh/basket cable tray.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NEMA VE 1 - Metal Cable Tray Systems 2017.
- D. NEMA VE 2 - Cable Tray Installation Guidelines 2018.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the arrangement of cable tray with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others. Coordinate the work with other trades to avoid installation of obstructions within cable tray required clearances.
  - 2. Coordinate arrangement of cable tray with the dimensions and clearance requirements of the actual products to be installed.
  - 3. Coordinate the work with placement of supports, anchors, etc. required for mounting.
  - 4. Notify of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Preinstallation Meeting: Convene one week prior to commencing work of this section; require attendance of all affected installers. Review proposed routing, sequence of installation, and protection requirements for installed cable tray.
- C. Sequencing:
  - 1. Do not begin installation of cables until installation of associated cable tray run is complete.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cable tray system components and accessories. Include dimensions, materials, fabrication details, finishes, and span/load ratings.

**1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.



### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NEMA VE 2, except do not store cable tray outdoors without cover as permitted in NEMA VE 2.
- B. Handle products carefully to avoid damage to finish.

## **PART 2 PRODUCTS**

### **2.01 CABLE TRAY SYSTEM - GENERAL REQUIREMENTS**

- A. Provide new cable tray system consisting of all required components, fittings, supports, accessories, etc. as necessary for a complete system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Do not use cable tray for applications other than as permitted by NFPA 70 and product listing/classification.
- D. Provide cable tray system and associated components suitable for use at indicated span/load ratings under the service conditions at the installed location.
- E. Unless otherwise indicated, specified span/load ratings are based on safety factor of 1.5 and working load only (no additional concentrated static load), with ratings for metal cable tray systems in accordance with NEMA VE 1.
- F. Unless otherwise indicated, specified load/fill depths and inside widths are nominal values, with values for metal cable tray systems in accordance with NEMA VE 1 including applicable allowable tolerances.

### **2.02 METAL CABLE TRAY SYSTEMS**

- A. Manufacturers:
  - 1. Metal Cable Tray System:
    - a. Cablofil, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).
    - b. Chalfant Manufacturing Company: [www.chalfant-obo.com/#sle](http://www.chalfant-obo.com/#sle).
    - c. Cope, a brand of Atkore International Inc: [www.copecabletray.com/#sle](http://www.copecabletray.com/#sle).
    - d. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
    - e. or UL approved equal.
  - 2. Source Limitations: Furnish cable tray system and associated components and accessories produced by a single manufacturer and obtained from a single supplier.
- B. Comply with NEMA VE 1.
- C. Finishes:
  - 1. Zinc Electroplated Steel: Comply with ASTM B633.
- D. Metal Wire Mesh/Basket Cable Tray:
  - 1. Material: Zinc electroplated steel or mill-galvanized before fabrication (pre-galvanized) steel.
  - 2. Tray Depth: 2 inches (51 mm).
  - 3. Mesh Spacing: 2 by 4 inches (51 by 102 mm).
  - 4. Tray Width: 12 inches (305 mm).

### **2.03 SOURCE QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Metal Cable Tray: Perform factory design tests in accordance with NEMA VE 1, including electrical continuity and load testing.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that work likely to damage cable tray system has been completed.
- B. Verify that field measurements are as indicated.

- C. Verify that the dimensions and span/load ratings of cable tray system components are consistent with the indicated requirements.
- D. Verify that mounting surfaces are ready to receive cable tray and associated supports.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install cable tray in accordance with NECA 1 (general workmanship), and NEMA VE 2.
- C. Unless otherwise indicated, arrange cable tray to be parallel or perpendicular to building lines.
- D. Arrange cable tray to provide required clearances and maintain cable access.
- E. Install cable tray plumb and level, with sections aligned and with horizontal runs at the proper elevation.
- F. Metal Wire Mesh/Basket Cable Tray: Field fabricate fittings in accordance with manufacturer's instructions, using only manufacturer-approved connectors classified for bonding.
  - 1. Inside Radius of Fittings: 12 inches (305 mm).
- G. Cable Tray Movement Provisions:
  - 1. Provide suitable expansion fittings where cable tray is subject to movement, including but not limited to:
    - a. Where cable tray crosses structural joints intended for expansion.
    - b. Long straight cable tray runs in accordance with NEMA VE 2.
  - 2. Use expansion guides in lieu of hold-down clamps where prescribed in NEMA VE 2.
  - 3. Set gaps for expansion fittings in accordance with NEMA VE 2.
- H. Cable Provisions:
  - 1. Use suitable fixed barrier strips to maintain separation of cables as indicated and as required by NFPA 70.
  - 2. Use suitable drop-out fittings or bushings where cables exit cable tray as required to maintain minimum cable bending radius.
  - 3. Use suitable cable support fittings for long vertical cable tray runs with heavy cables.
- I. Provide end closures at unconnected ends of cable tray runs.
- J. Cable Tray Support:
  - 1. Use manufacturer's recommended hangers and supports, located in accordance with NEMA VE 2 and manufacturer's requirements, but not exceeding specified span unless otherwise approved by Engineer. Provide required support and attachment in accordance with Section 26 05 29, where not furnished by cable tray manufacturer.
  - 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- K. Grounding and Bonding Requirements, in Addition to Requirements of Section 26 05 26:
  - 1. Comply with grounding and bonding requirements of NEMA VE 2.
  - 2. Metal Cable Tray Systems: Use suitable bonding jumpers or classified connectors to provide electrical continuity.
  - 3. Provide suitable equipment grounding conductor in each cable tray, except where cable tray contains only multiconductor cables with integral equipment grounding conductors. Do not use metal cable tray system as sole equipment grounding conductor.
- L. Conduit Termination:
  - 1. Use listed cable tray conduit clamps (evaluated for bonding connection) to terminate conduits at cable tray.
  - 2. Provide insulating bushing at conduit termination to protect cables.
  - 3. Provide independent support for conduit.
- M. Cable Installation:
  - 1. Comply with cable installation requirements of NEMA VE 2.

2. Use appropriate cable pulling tools, applied to prevent excessive force on cable tray system and maintain minimum cable bending radius.
3. Use cable clamps or cable ties to fasten conductors/cables to vertical and horizontal runs of cable tray.
  - a. Distance Between Fastening Points for Vertical Runs: 18 inches (450 mm).
  - b. Distance Between Fastening Points for Horizontal Runs: As required to maintain spacing and confine conductor/cable within the cable fill area.
- N. Penetrations: Install firestopping to preserve fire resistance rating of building elements, using materials and methods specified in Section 07 84 00.
- O. Identification Requirements, in Addition to Those Specified in Section 26 05 53.
- P. Install cable tray covers where indicated and as follows:

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect cable tray system for damage and defects.
- C. Correct deficiencies and replace damaged or defective cable tray system components.

### **3.04 ADJUSTING**

- A. Adjust tightness of mechanical connections to manufacturer's recommended torque settings.

### **3.05 CLEANING**

- A. Remove dirt and debris from cable tray.
- B. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### **3.06 PROTECTION**

- A. Protect cable tray system from subsequent construction operations.

**END OF SECTION**

**SECTION 26 05 48  
VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Vibration isolation requirements.
- B. Seismic control requirements.
  - 1. Includes requirements for seismic qualification of equipment not specified in this section.
- C. Vibration-isolated equipment support bases.
- D. Vibration isolators.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

**1.03 DEFINITIONS**

- A. Electrical Component: Where referenced in this section in regards to seismic controls, applies to any portion of the electrical system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., conduit, cable tray).
- B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

**1.04 REFERENCE STANDARDS**

- A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications Most Recent Edition Cited by Referring Code or Reference Standard.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.05 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

**1.06 QUALITY ASSURANCE**

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

**PART 2 PRODUCTS**

**2.01 VIBRATION ISOLATION REQUIREMENTS**

- A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing electrical equipment and/or electrical connections to vibration-isolated equipment.

- B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:
- C. General Requirements:
  - 1. Select vibration isolators to provide required static deflection.
  - 2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
- D. Equipment Isolation:
  - 1. Transformers:
    - a. Specified vibration isolators are in addition to any factory-installed internal core and coil assembly vibration isolators unless otherwise indicated.
    - b. Floor-Mounted Transformers, Seismic Applications: Use seismic type resilient material isolator mounts or seismic type restrained spring isolators.
    - c. Suspended Transformers, Seismic Applications: Use seismic type resilient material isolator hangers, seismic type spring isolator hangers, or seismic type combination resilient material/spring isolator hangers.
- E. Conduit Isolation:
  - 1. Use flexible conduit or cable for electrical connections to vibration-isolated equipment, including equipment installed under other sections or by others.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install products in accordance with applicable requirements of NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Secure fasteners according to manufacturer's recommended torque settings.
- E. Install flexible conduit and cable connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
- F. Vibration Isolation Systems:
  - 1. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
  - 2. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
  - 3. Adjust isolators to be free of isolation short circuits during normal operation.
  - 4. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

#### **3.02 FIELD QUALITY CONTROL**

- A. Inspect vibration isolation and/or seismic control components for damage and defects.
- B. Vibration Isolation Systems:
  - 1. Verify isolator static deflections.
  - 2. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.
- C. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

**END OF SECTION**

**SECTION 26 05 53**  
**IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Underground warning tape.
- F. Warning signs and labels.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- B. Section 26 05 36 - Cable Trays for Electrical Systems: Additional identification requirements for cable tray systems.
- C. Section 27 10 00 - Structured Cabling: Identification for communications cabling and devices.

**1.03 REFERENCE STANDARDS**

- A. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. UL 969 - Marking and Labeling Systems Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
  - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
  - 2. Do not install identification products until final surface finishes and painting are complete.

**1.05 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**1.06 FIELD CONDITIONS**

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

**PART 2 PRODUCTS**

**2.01 IDENTIFICATION REQUIREMENTS**

- A. Identification for Equipment:
  - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
  - 2. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
    - a. Service equipment.
    - b. Industrial control panels.
    - c. Motor control centers.
    - d. Elevator control panels.
    - e. Industrial machinery.

3. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
- B. Identification for Conductors and Cables:
  1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
  2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
- C. Identification for Boxes:
- D. Identification for Devices:

## **2.02 IDENTIFICATION NAMEPLATES AND LABELS**

- A. Identification Nameplates:
  1. Materials:
  2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
  3. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- B. Identification Labels:
  1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
  2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
  1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
  2. Legend:
    - a. Equipment designation or other approved description.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height:
    - a. Equipment Designation: 1/2 inch (13 mm).
  5. Color:
    - a. Normal Power System: White text on black background.

## **2.03 WIRE AND CABLE MARKERS**

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- E. Minimum Text Height: 1/8 inch (3 mm).
- F. Color: Black text on white background unless otherwise indicated.

## **2.04 VOLTAGE MARKERS**

- A. Minimum Size:
- B. Legend:
- C. Color: Black text on orange background unless otherwise indicated.

## **2.05 UNDERGROUND WARNING TAPE**

- A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:

## **2.06 WARNING SIGNS AND LABELS**

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
  - 1. Materials:
  - 2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- C. Warning Labels:
  - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
  - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
  - 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
  - 1. Surface-Mounted Equipment: Enclosure front.
  - 2. Flush-Mounted Equipment: Inside of equipment door.
  - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
  - 4. Elevated Equipment: Legible from the floor or working platform.
  - 5. Interior Components: Legible from the point of access.
  - 6. Boxes: Outside face of cover.
  - 7. Conductors and Cables: Legible from the point of access.
  - 8. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

**END OF SECTION**



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**SECTION 26 05 83  
WIRING CONNECTIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical connections to equipment.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26 05 33.13 - Conduit for Electrical Systems.
- C. Section 26 05 33.16 - Boxes for Electrical Systems.
- D. Section 26 27 26 - Wiring Devices.
- E. Section 26 28 16.16 - Enclosed Switches.

**1.03 REFERENCE STANDARDS**

- A. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2020).
- B. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2021.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
  - 2. Determine connection locations and requirements.
- B. Sequencing:
  - 1. Install rough-in of electrical connections before installation of equipment is required.
  - 2. Make electrical connections before required start-up of equipment.

**1.05 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
  - 1. Colors: Comply with NEMA WD 1.
  - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
  - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Disconnect Switches: As specified in Section 26 28 16.16 and in individual equipment sections.
- C. Wiring Devices: As specified in Section 26 27 26.
- D. Flexible Conduit: As specified in Section 26 05 33.13.
- E. Wire and Cable: As specified in Section 26 05 19.
- F. Boxes: As specified in Section 26 05 33.16.

**2.02 EQUIPMENT CONNECTIONS**

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

### **3.02 ELECTRICAL CONNECTIONS**

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

**END OF SECTION**

**SECTION 26 09 23**  
**LIGHTING CONTROL DEVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Occupancy sensors.
- B. Outdoor motion sensors.
- C. Time switches.
- D. In-wall time switches.
- E. In-wall interval timers.
- F. Outdoor photo controls.
- G. Daylighting controls.
- H. Lighting contactors.
- I. Accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 29 - Hangers and Supports for Electrical Systems
- B. Section 26 05 33.16 - Boxes for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 27 26 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
  - 1. Includes finish requirements for wall controls specified in this section.
  - 2. Includes accessory receptacles, switches, dimmers and wall plates, to match lighting controls specified in this section.
- E. Section 26 51 00 - Interior Lighting.
- F. Section 26 56 00 - Exterior Lighting.

**1.03 REFERENCE STANDARDS**

- A. 47 CFR 15 - Radio Frequency Devices current edition.
- B. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment - Nonlocking (Button) Type Photocontrols 2020.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- F. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts 2020.
- G. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts 2008 (Reaffirmed 2020).
- H. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices 2017.
- I. NEMA ICS 6 - Industrial Control and Systems: Enclosures 1993 (Reaffirmed 2016).
- J. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control Current Edition, Including All Revisions.
- L. UL 916 - Energy Management Equipment Current Edition, Including All Revisions.
- M. UL 917 - Clock-Operated Switches Current Edition, Including All Revisions.

- N. UL 1472 - Solid-State Dimming Controls Current Edition, Including All Revisions.
- O. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules Current Edition, Including All Revisions.
- P. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
  - 3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
  - 4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
  - 5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
- B. Sequencing:
  - 1. Do not install lighting control devices until final surface finishes and painting are complete.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
- C. Field Quality Control Reports.
- D. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Operation and Maintenance Data: Include detailed information on device programming and setup.
- F. Project Record Documents: Record actual installed locations and settings for lighting control devices.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

#### **1.08 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

## **1.09 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for all occupancy sensors.
- C. Provide two year manufacturer warranty for all daylighting controls.

## **PART 2 PRODUCTS**

### **2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS**

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.
- C. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

### **2.02 OCCUPANCY SENSORS**

- A. Manufacturers:
  - 1. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. All Occupancy Sensors:
  - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
  - 2. Sensor Technology:
    - a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
  - 3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
  - 4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
  - 5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
  - 6. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
  - 7. Sensitivity: Field adjustable.
  - 8. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
  - 9. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.
  - 10. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
  - 11. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.
  - 12. Wireless Sensors:
    - a. RF Range: 30 feet (9 m) through typical construction materials.
    - b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
    - c. Power: Battery-operated with minimum ten-year battery life.
- C. Wall Switch Occupancy Sensors:
  - 1. All Wall Switch Occupancy Sensors:

- a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
  - b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
  - c. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
  - d. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.
- D. Wall Dimmer Occupancy Sensors:
- 1. General Requirements:
    - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.
    - b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
    - c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
    - d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
    - e. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.
- E. Power Packs for Low Voltage Occupancy Sensors:
- 1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
  - 2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
  - 3. Input Supply Voltage: Dual rated for 120/277 V ac.
  - 4. Load Rating: As required to control the load indicated on drawings.
- F. Power Packs for Wireless Occupancy Sensors:
- 1. Description: Plenum rated, self-contained relay compatible with specified wireless occupancy sensors for switching of line voltage loads.
  - 2. Input Supply Voltage: Dual rated for 120/277 V ac.
  - 3. Load Rating: As required to control the load indicated on drawings.

## 2.03 OUTDOOR MOTION SENSORS

- A. Manufacturers:
  - 1. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. Description: Factory-assembled wet location listed device suitable for wall or ceiling/eave mounting, with integral swivel for field adjustment of coverage, capable of detecting motion for automatic control of load indicated.
- C. Sensor Technology: Passive Infrared (PIR) designed to detect occupancy by sensing movement of thermal energy between zones.
- D. Operation: Unless otherwise indicated, motion sensor to turn load on when motion is detected and to turn load off when no motion is detected during an adjustable turn-off delay time interval.
- E. Turn-Off Delay: Field adjustable, with time delay settings available up to 15 minutes.
- F. Integral Photocell: For dusk to dawn operation.

- G. Manual Override: Activated by switching power off to unit and then back on.
- H. Load Rating: 1,000 W incandescent and fluorescent load at 120 V ac.
- I. Coverage: Capable of detecting motion within a distance of 50 feet (15 m) at a mounting height of 8 feet (2.4 m), with a field of view of 270 degrees.

## **2.04 TIME SWITCHES**

- A. Manufacturers:
  - 1. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. Digital Electronic Time Switches:
  - 1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
  - 2. Program Capability:
    - a. Astronomic Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
  - 3. Schedule Capacity: Not less than 16 programmable on/off operations.
  - 4. Provide automatic daylight savings time and leap year compensation.
  - 5. Provide power outage backup to retain programming and maintain clock.
  - 6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
  - 7. Input Supply Voltage: As indicated on the drawings.
  - 8. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:
- C. Electromechanical Time Switches:
  - 1. Description: Factory-assembled controller with motor-operated timing dial mechanism and adjustable trippers for setting on/off operations, listed and labeled as complying with UL 917.
  - 2. Program Capability:
    - a. Astronomic Time Switches: With same schedule for each day of the week and skip-a-day feature to omit selected days with automatic adjustment for seasonal changes in sunrise and sunset times.
  - 3. Schedule Capacity:
    - a. Astronomic Time Switches: Capable of turning load on at sunset and off at either sunrise or selected fixed time.
  - 4. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
  - 5. Input Supply Voltage: As indicated on the drawings.
  - 6. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:

## **2.05 IN-WALL TIME SWITCHES**

- A. Manufacturers:
  - 1. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. Digital Electronic In-Wall Time Switches:
  - 1. Description: Factory-assembled solid state programmable controller with LCD display, suitable for mounting in standard wall box, and listed and labeled as complying with UL 916 or UL 917.
  - 2. Program Capability:
    - a. Astronomic Time Switches: Capable of different schedule for each day of the week and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.



3. Schedule Capacity: Not less than 40 programmable on/off operations.
4. Provide power outage backup to retain programming and maintain clock.
5. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
6. Switch Configuration: Suitable for use in either SPST or 3-way application.

## **2.06 IN-WALL INTERVAL TIMERS**

- A. Manufacturers:
  1. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. Digital Electronic In-Wall Interval Timers:
  1. Description: Factory-assembled solid state programmable controller with LCD display, suitable for mounting in standard wall box, and listed and labeled as complying with UL 916 or UL 917.
  2. Program Capability: Designed to turn load off at end of preset time interval.
  3. Time Interval: Field selectable range of presets available up to 12 hours.
  4. Provide field selectable audible and visual indication to warn that end of interval operation is about to turn off load.
  5. Provide power outage backup to retain programming and maintain clock.
  6. Manual override: Capable of both turning load off and resetting timer to original preset time interval.
  7. Switch Configuration: Suitable for use in either SPST or 3-way application.

## **2.07 OUTDOOR PHOTO CONTROLS**

- A. Manufacturers:
  1. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. Stem-Mounted Outdoor Photo Controls:
  1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
  2. Housing: Weatherproof, impact resistant polycarbonate.
  3. Photo Sensor: Cadmium sulfide.
  4. Provide external sliding shield for field adjustment of light level activation.
  5. Light Level Activation: 1 to 5 footcandles (10.8 to 53.8 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
  6. Voltage: As required to control the load indicated on the drawings.
  7. Failure Mode: Fails to the on position.
  8. Load Rating: As required to control the load indicated on the drawings.
- C. Button Type Outdoor Photo Controls
  1. Description: Direct-wired photo control unit complying with ANSI C136.24 with weatherproof gasketed wall plate where required or indicated, listed and labeled as complying with UL 773A.
  2. Housing: Weather resistant polycarbonate.
  3. Photo Sensor: Cadmium sulfide.
  4. Light Level Activation: 1 to 3 footcandles (10.8 to 32.3 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
  5. Voltage: As required to control the load indicated on the drawings.
  6. Failure Mode: Fails to the on position.
  7. Load Rating: As required to control the load indicated on the drawings.

## **2.08 DAYLIGHTING CONTROLS**

- A. Manufacturers:
  1. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

- B. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.
- C. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.
  - 1. Sensor Type: Filtered silicon photo diode.
  - 2. Sensor Range:
- D. Dimming Photo Sensors: Photo sensor units with integral controller compatible with specified dimming ballasts, for direct continuous dimming of up to 50 ballasts.
- E. Daylighting Control Switching Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors, for switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
  - 1. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
  - 2. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
  - 3. Control Capability:
- F. Daylighting Control Switching Modules for Wireless Sensors:
  - 1. Description: Plenum rated, self-contained relay compatible with specified wireless photo sensors for switching of line voltage loads in response to changes in measured light levels according to selected settings.
  - 2. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
  - 3. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
  - 4. Control Capability: Capable of controlling one programmable channel.
  - 5. Input Supply Voltage: Dual rated for 120/277 V ac.
  - 6. Load Rating: As required to control the load indicated on drawings.
- G. Daylighting Control Dimming Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors and with specified dimming ballasts, for both continuous dimming of compatible dimming ballasts and switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
  - 1. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
  - 2. Control Capability: Capable of controlling up to three separately programmable channels, with up to 50 ballasts per channel.
  - 3. Dimming and Fade Rates: Adjustable from 5 to 60 seconds.
  - 4. Cut-Off Delay: Selectable and adjustable from 0 to 20 minutes.
- H. Daylighting Control Dimming Modules for Wireless Sensors:
  - 1. Description: Plenum rated control unit compatible with specified wireless photo sensors and with specified dimming ballasts, for continuous dimming of compatible dimming ballasts in response to changes in measured light levels according to selected settings.
  - 2. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
  - 3. Load to be turned off when available daylight is sufficient to fully dim the load, after the selected time delay.
  - 4. Control Capability: Capable of controlling up to 32 ballasts with up to two separately programmable daylighting zones.

- I. Power Packs for Low Voltage Daylighting Control Modules:
  - 1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage daylighting control modules for switching of line voltage loads. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
  - 2. Input Supply Voltage: Dual rated for 120/277 V ac.
  - 3. Load Ratings: As required to control the load indicated on drawings.
- J. Accessories:
  - 1. Where indicated, provide compatible accessory wall switches for manual override control.
  - 2. Where indicated, provide compatible accessory wireless controls for manual override control.

## **2.09 LIGHTING CONTACTORS**

- A. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on the drawings.
- B. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactor(s) and externally operable disconnect.
  - 1. Disconnects: Circuit breaker type.
    - a. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
    - b. Provide auxiliary interlock for disconnection of external control power sources where applicable.
- C. Short Circuit Current Rating:
  - 1. Provide contactors with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- D. Enclosures:
  - 1. Comply with NEMA ICS 6.
  - 2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
  - 3. Finish: Manufacturer's standard unless otherwise indicated.

## **2.10 ACCESSORIES**

- A. Auxiliary Contacts:
  - 1. Comply with NEMA ICS 5.
  - 2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each lighting contactor, minimum.
- B. Pilot Devices:
  - 1. Comply with NEMA ICS 5; heavy-duty type.
  - 2. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.
  - 3. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
  - 4. Indicating Lights: Push-to-test type unless otherwise indicated.
  - 5. Provide LED lamp source for indicating lights and illuminated devices.
- C. Control and Timing Relays:
  - 1. Comply with NEMA ICS 5.
  - 2. Provide number and type of relays indicated or required to perform necessary functions.
- D. Fire-Rated Device Enclosures:
  - 1. Provide as required to preserve fire resistance rating of building elements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of lighting control devices provided under this section.
  - 1. Mounting Heights: Unless otherwise indicated, as follows:
    - a. Wall Switch Occupancy Sensors: 48 inches (1.2 m) above finished floor.
    - b. In-Wall Time Switches: 48 inches (1.2 m) above finished floor.
    - c. In-Wall Interval Timers: 48 inches (1.2 m) above finished floor.
  - 2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- E. Install lighting control devices plumb and level, and held securely in place.
- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.
- G. Provide required supports in accordance with Section 26 05 29.
- H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- I. Occupancy Sensor Locations:
  - 1. Location Adjustments: Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.
  - 2. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
- J. Outdoor Photo Control Locations:
  - 1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
  - 2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

- K. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.
- L. Daylighting Control Photo Sensor Locations:
  - 1. Location Adjustments: Within the design intent, reasonably minor adjustments to locations may be made in order to optimize control and avoid conflicts or problems affecting proper detection of light levels.
  - 2. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for proper control of respective room or area based on manufacturer's recommendations for installed devices.
  - 3. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
  - 4. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.
- M. Combination Enclosed Lighting Contactors:
  - 1. Except where indicated to be mounted adjacent to the equipment they supply, mount lighting contactors such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- N. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
- O. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.
- P. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- D. Test time switches to verify proper operation.
- E. Test outdoor photo controls to verify proper operation, including time delays where applicable.
- F. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.
- G. Correct wiring deficiencies and replace damaged or defective lighting control devices.

### **3.04 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
- C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.
- D. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect. Record settings in written report to be included with submittals.

- E. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.
- F. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

### **3.05 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### **3.06 COMMISSIONING**

- A. See Section 01 91 13 - General Commissioning Requirements for commissioning requirements.

### **3.07 CLOSEOUT ACTIVITIES**

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.
- D. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
  - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

**END OF SECTION**

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**SECTION 26 22 00**  
**LOW-VOLTAGE TRANSFORMERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General purpose transformers.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 33.13 - Conduit for Electrical Systems: Flexible conduit connections.
- E. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
- F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers Current Edition.
- B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers 2015.
- C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers 2013.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers 2015.
- F. NEMA ST 20 - Dry Type Transformers for General Applications 2021.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 506 - Standard for Specialty Transformers Current Edition, Including All Revisions.
- J. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate the work with placement of supports, anchors, etc. required for mounting.
  - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.



- C. Manufacturer's equipment seismic qualification certification.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

#### **1.08 FIELD CONDITIONS**

- A. Ambient Temperature: Do not exceed the following maximum temperatures during and after installation of transformers.
  - 1. Greater than 10 kVA: 104 degrees F (40 degrees C) maximum.
  - 2. Less than 10 kVA: 77 degrees F (25 degrees C) maximum.

#### **1.09 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. ABB/GE; [\_\_\_\_]: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
- B. Eaton Corporation; [\_\_\_\_]: [www.eaton.com/#sle](http://www.eaton.com/#sle).
- C. Schneider Electric; Square D Products: [www.schneider-electric.us/#sle](http://www.schneider-electric.us/#sle).
- D. Siemens Industry, Inc; [\_\_\_\_]: [www.usa.siemens.com/#sle](http://www.usa.siemens.com/#sle).
- E. Substitutions: See Section 01 60 00 - Product Requirements.

#### **2.02 TRANSFORMERS - GENERAL REQUIREMENTS**

- A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.
- B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
  - 1. Altitude: Less than 3,300 feet (1,000 m).
  - 2. Ambient Temperature:
    - a. Greater than 10 kVA: Not exceeding 104 degrees F (40 degrees C).
    - b. Less than 10 kVA: Not exceeding 77 degrees F (25 degrees C).
- C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.
- D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.
- E. Basic Impulse Level: 10 kV.
- F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- G. Isolate core and coil from enclosure using vibration-absorbing mounts.

- H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

### **2.03 GENERAL PURPOSE TRANSFORMERS**

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.
- B. Insulation System and Allowable Average Winding Temperature Rise:
1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.
  2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.
- C. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.
- D. Winding Taps:
1. Less than 3 kVA: None.
  2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
  3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
  4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.
- E. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
- F. Sound Levels: Standard sound levels complying with NEMA ST 20
- G. Mounting Provisions:
1. Less than 15 kVA: Suitable for wall mounting.
  2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
  3. Larger than 75 kVA: Suitable for floor mounting.
- H. Transformer Enclosure: Comply with NEMA ST 20.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
  2. Construction: Steel.
    - a. Less than 15 kVA: Totally enclosed, non-ventilated.
    - b. 15 kVA and Larger: Ventilated.
  3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
  4. Provide lifting eyes or brackets.

### **2.04 SOURCE QUALITY CONTROL**

- A. Factory test transformers according to NEMA ST 20.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.
- C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install transformers in accordance with NECA 409 and IEEE C57.94.
- D. Use flexible conduit, under the provisions of Section 26 05 33.13, 2 feet (600 mm) minimum length, for connections to transformer case. Make conduit connections to side panel of

enclosure.

- E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.
- F. Install transformers plumb and level.
- G. Transformer Support:
  - 1. Provide required support and attachment in accordance with Section 26 05 29, where not furnished by transformer manufacturer.
  - 2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.
  - 3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 30 00.
  - 4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- H. Provide grounding and bonding in accordance with Section 26 05 26.
- I. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.
- J. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.
- K. Where furnished as a separate accessory, install transformer weathershield per manufacturer's instructions.
- L. Identify transformers in accordance with Section 26 05 53.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.

### **3.04 ADJUSTING**

- A. Measure primary and secondary voltages and make appropriate tap adjustments.
- B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

### **3.05 CLEANING**

- A. Clean dirt and debris from transformer components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

**SECTION 26 24 16  
PANELBOARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Load centers.
- D. Overcurrent protective devices for panelboards.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 22 00 - Low-Voltage Transformers: Small power centers with integral primary breaker, transformer, and panelboard.
- D. Section 26 43 00 - Surge Protective Devices.

**1.03 REFERENCE STANDARDS**

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e, with Amendment (2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- E. NEMA PB 1 - Panelboards 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less 2013.
- G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- J. UL 67 - Panelboards Current Edition, Including All Revisions.
- K. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
  - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

### **1.08 FIELD CONDITIONS**

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
  - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

## **PART 2 PRODUCTS**

### **2.01 PANELBOARDS - GENERAL REQUIREMENTS**

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet (2,000 m).
  - 2. Ambient Temperature:
    - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- C. Short Circuit Current Rating:
  - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
  - 1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
  - 2. Boxes: Galvanized steel unless otherwise indicated.
    - a. Provide wiring gutters sized to accommodate the conductors to be installed.
  - 3. Fronts:

- a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
- b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
- c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
- 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- J. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list and label panelboards as a complete assembly including surge protective device.
- K. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

## **2.02 POWER DISTRIBUTION PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  - 1. Phase and Neutral Bus Material: Aluminum or copper.
  - 2. Ground Bus Material: Aluminum or copper.
- D. Circuit Breakers:
  - 1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
- E. Enclosures:
  - 1. Provide surface-mounted enclosures unless otherwise indicated.

## **2.03 LIGHTING AND APPLIANCE PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
  - 2. Phase and Neutral Bus Material: Aluminum or copper.
  - 3. Ground Bus Material: Aluminum or copper.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
  - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
  - 2. Provide clear plastic circuit directory holder mounted on inside of door.

## **2.04 LOAD CENTERS**

- A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.
- B. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Bus Material: Aluminum or copper.
- C. Circuit Breakers: Thermal magnetic plug-in type.
- D. Enclosures:
  1. Provide flush-mounted enclosures unless otherwise indicated.
  2. Provide circuit directory label on inside of door or individual circuit labels adjacent to circuit breakers.

## **2.05 OVERCURRENT PROTECTIVE DEVICES**

- A. Molded Case Circuit Breakers:
  1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
  2. Interrupting Capacity:
    - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
    - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
  3. Conductor Terminations:
    - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
  5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

## **2.06 SOURCE QUALITY CONTROL**

- A. Factory test panelboards according to NEMA PB 1.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 26 05 29.
- F. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- I. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- J. Provide grounding and bonding in accordance with Section 26 05 26.

- K. Install all field-installed branch devices, components, and accessories.
- L. Provide filler plates to cover unused spaces in panelboards.

**3.03 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

**3.04 CLEANING**

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**



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**SECTION 26 27 26  
WIRING DEVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Wall switches.
- B. Wall dimmers.
- C. Fan speed controllers.
- D. Receptacles.
- E. Wall plates.
- F. Floor box service fittings.
- G. Poke-through assemblies.
- H. Access floor boxes.

**1.02 RELATED REQUIREMENTS**

- A. Section 09 69 00 - Access Flooring.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- C. Section 26 05 33.16 - Boxes for Electrical Systems.
- D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26 05 83 - Wiring Connections: Cords and plugs for equipment.
- F. Section 26 09 23 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.
- G. Section 27 10 00 - Structured Cabling: Voice and data jacks.

**1.03 REFERENCE STANDARDS**

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for 2014h, with Amendments (2017).
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification) 2014g, with Amendment (2017).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2020).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2021.
- G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.
- L. UL 1310 - Class 2 Power Units Current Edition, Including All Revisions.
- M. UL 1449 - Standard for Surge Protective Devices Current Edition, Including All Revisions.
- N. UL 1472 - Solid-State Dimming Controls Current Edition, Including All Revisions.
- O. UL 1917 - Solid-State Fan Speed Controls Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
  - 3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
  - 4. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
  - 5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Products: Listed, classified, and labeled as suitable for the purpose intended.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

### **PART 2 PRODUCTS**

#### **2.01 WIRING DEVICE APPLICATIONS**

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- D. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.
- E. Provide GFCI protection for receptacles installed in kitchens.
- F. Provide GFCI protection for receptacles serving electric drinking fountains.
- G. Provide isolated ground receptacles for receptacles serving computers and electronic cash registers.
- H. Unless noted otherwise, do not use combination switch/receptacle devices.

#### **2.02 WIRING DEVICE FINISHES**

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.
- C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
- D. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.
- E. Wiring Devices in painted accent and/or wood wall locations, Gray wiring devices and stainless steel plate.

### 2.03 WALL SWITCHES

- A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

### 2.04 WALL DIMMERS

- A. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.
- B. Control: Slide control type with separate on/off switch.
- C. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:

### 2.05 FAN SPEED CONTROLLERS

- A. Description: 120 V AC, solid-state, full-range variable speed, slide control type with separate on/off switch, with integral radio frequency interference filtering, fan noise elimination circuitry, power failure preset memory, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1917.
  - 1. Current Rating: 1.5 A unless otherwise indicated or required to control the load indicated on the drawings.

### 2.06 RECEPTACLES

- A. Manufacturers:
  - 1. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.
- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
  - 2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
  - 1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
  - 2. Automatically Controlled Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; controlled receptacle marking on device face per NFPA 70; single or duplex as indicated on the drawings.
  - 3. Isolated Ground Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, with ground contacts isolated from mounting strap; isolated ground triangle mark on device face; single or duplex as indicated on the drawings.
  - 4. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
  - 5. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.

6. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
- D. GFCI Receptacles:
  1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
    - a. Provide test and reset buttons of same color as device.
  2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
  3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.
  4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
  5. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.
- E. USB Charging Devices:
  1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
    - a. Charging Capacity - Four-Port Devices: 4.2 A, minimum.
  2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.
- F. Surge Protection Receptacles:
  1. Surge Protection Receptacles - General Requirements: Listed and labeled as complying with UL 1449, Type 2 or 3.
    - a. Energy Dissipation: Not less than 240 J per mode.
    - b. Protected Modes: L-N, L-G, N-G.
    - c. UL 1449 Voltage Protection Rating (VPR): Not more than 700 V for L-N, L-G modes and 1200 V for N-G mode.
    - d. Diagnostics:
      - 1) Visual Notification: Provide indicator light to report functional status of surge protection.
  2. Standard Surge Protection Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
  3. Isolated Ground Surge Protection Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, with ground contacts isolated from mounting strap.

## 2.07 WALL PLATES

- A. Manufacturers:
  1. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.
- B. Wall Plates: Comply with UL 514D.
  1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
  2. Size: Standard.
  3. Screws: Metal with slotted heads finished to match wall plate finish.
- C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

- E. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.
- F. Premarked Wall Plates: Factory labeled as indicated; hot stamped for nylon wall plates and engraved for metal wall plates.
- G. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.
- H. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

## **2.08 FLOOR BOX SERVICE FITTINGS**

- A. Description: Service fittings compatible with floor boxes provided under Section 26 05 33.16 with components, adapters, and trims required for complete installation.
- B. Above-Floor Service Fittings:
  - 1. Single Service Pedestal Convenience Receptacles:
    - a. Configuration: One standard convenience duplex receptacle.
  - 2. Single Service Pedestal Communications Outlets:
    - a. Configuration: One 1 inch bushed opening.
    - b. Voice and Data Jacks: As specified in Section 27 10 00.
  - 3. Single Service Pedestal Furniture Feed:
    - a. Configuration: One 3/4 inch knockout.
  - 4. Dual Service Pedestal Combination Outlets:
    - a. Configuration:
      - 1) Power: One standard convenience duplex receptacle.
      - 2) Communications: One 1 inch bushed opening.
      - 3) Voice and Data Jacks: As specified in Section 27 10 00.
    - b. Provide barrier to separate line and low voltage compartments.
- C. Flush Floor Service Fittings:
  - 1. Single Service Flush Convenience Receptacles:
    - a. Cover: Rectangular.
    - b. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
  - 2. Single Service Flush Communications Outlets:
    - a. Cover: Rectangular.
    - b. Configuration: One RJ-45 port .
    - c. Voice and Data Jacks: As specified in Section 27 10 00.
  - 3. Single Service Flush Furniture Feed:
    - a. Cover: Rectangular.
    - b. Configuration: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
  - 4. Dual Service Flush Combination Outlets:
    - a. Cover: Rectangular.
    - b. Configuration:
      - 1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).
      - 2) Communications: One RJ-45 port.
      - 3) Voice and Data Jacks: As specified in Section 27 10 00.
  - 5. Dual Service Flush Furniture Feed:
    - a. Cover: Rectangular.
    - b. Configuration:
      - 1) Power: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
      - 2) Communications: One 2-1/8 inch by 1 inch combination threaded opening(s).

## 2.09 POKE-THROUGH ASSEMBLIES

- A. Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.
- B. Above-Floor Service Fittings:
  - 1. Single Service Pedestal Communications Outlets:
    - a. Configuration: One 1 inch bushed opening.
    - b. Voice and Data Jacks: As specified in Section 27 10 00.
  - 2. Single Service Pedestal Furniture Feed:
    - a. Configuration: One 3/4 inch knockout.
  - 3. Dual Service Pedestal Combination Outlets:
    - a. Configuration:
      - 1) Power: One standard convenience duplex receptacle.
      - 2) Communications: One 1 inch bushed opening.
      - 3) Voice and Data Jacks: As specified in Section 27 10 00.
    - b. Provide barrier to separate line and low voltage compartments.
- C. Flush Floor Service Fittings:
  - 1. Single Service Flush Convenience Receptacles:
    - a. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
  - 2. Single Service Flush Communications Outlets:
    - a. Configuration: One RJ-45 port.
    - b. Voice and Data Jacks: As specified in Section 27 10 00.
  - 3. Single Service Flush Furniture Feed:
    - a. Configuration: One 2 inch by 1-1/4 inch combination threaded opening(s).
  - 4. Dual Service Flush Combination Outlets:
    - a. Cover: Hinged door(s).
    - b. Configuration:
      - 1) Power: One standard convenience duplex receptacle(s).
      - 2) Communications: One RJ-45 port.
      - 3) Voice and Data Jacks: As specified in Section 27 10 00.
  - 5. Dual Service Flush Furniture Feed:
    - a. Configuration:
      - 1) Power: One 3/4 inch threaded opening(s).
      - 2) Communications: Two 1/2 inch threaded opening(s).
  - 6. Accessories:
    - a. Closure Plugs: Size and fire rating as required to seal unused core hole and maintain fire rating of floor.

## 2.10 ACCESS FLOOR BOXES

- A. Manufacturers - Access Floor Boxes with Pre-wired Connectors for Manufactured Wiring Systems:
  - 1. Source Limitations: Provide access floor boxes with pre-wired connectors produced by the same manufacturer as the manufactured wiring system used for this project.
- B. Description: Metallic multi-service box suitable for mounting in access floor system specified in Section 09 69 00.
- C. Configuration:
  - 1. Power: Two standard convenience duplex receptacle(s).
  - 2. Communications: Two RJ-45 ports.
  - 3. Voice and Data Jacks: As specified in Section 27 10 00.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

#### **3.03 INSTALLATION**

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.
  - 1. Mounting Heights: Unless otherwise indicated, as follows:
    - a. Wall Switches: 48 inches (1200 mm) above finished floor.
    - b. Wall Dimmers: 48 inches (1200 mm) above finished floor.
    - c. Fan Speed Controllers: 48 inches (1200 mm) above finished floor.
    - d. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
  - 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
  - 3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
  - 4. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.
- I. Unless otherwise indicated, GFCI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFCI protection.
- J. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- K. Install wall switches with OFF position down.



- L. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- M. Do not share neutral conductor on branch circuits utilizing wall dimmers.
- N. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- O. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- P. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- Q. Identify wiring devices in accordance with Section 26 05 53.
- R. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

#### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Inspect each surge protection receptacle to verify surge protection is active.
- G. Correct wiring deficiencies and replace damaged or defective wiring devices.

#### **3.05 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.

#### **3.06 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

**END OF SECTION**

**SECTION 26 28 13  
FUSES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fuses.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- B. Section 26 28 16.16 - Enclosed Switches: Fusible switches.

**1.03 REFERENCE STANDARDS**

- A. NEMA FU 1 - Low Voltage Cartridge Fuses 2012.
- B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements Current Edition, Including All Revisions.
- D. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
    - a. Fusible Enclosed Switches: See Section 26 28 16.16.
  - 2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
  - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

**1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**PART 2 PRODUCTS**

**2.01 APPLICATIONS**

- A. General Purpose Branch Circuits: Class RK1, time-delay.
- B. Individual Motor Branch Circuits: Class RK1, time-delay.

**2.02 FUSES**

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C. Provide fuses of the same type, rating, and manufacturer within the same switch.
- D. Comply with UL 248-1.

- E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Class R Fuses: Comply with UL 248-12.
  - 1. Class RK1, Time-Delay Fuses:

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.
- B. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A. Do not install fuses until circuits are ready to be energized.
- B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

**END OF SECTION**

**SECTION 26 28 16.13**  
**ENCLOSED CIRCUIT BREAKERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Enclosed circuit breakers.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e, with Amendment (2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- G. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.
- C. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

**1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

### **1.08 FIELD CONDITIONS**

- A. Maintain ambient temperature between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed circuit breakers.

## **PART 2 PRODUCTS**

### **2.01 ENCLOSED CIRCUIT BREAKERS**

- A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet (2,000 m).
  - 2. Ambient Temperature: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- D. Short Circuit Current Rating:
  - 1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location indicated on the drawings.
- E. Conductor Terminations: Suitable for use with the conductors to be installed.
- F. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.
- G. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
- H. Provide externally operable handle with means for locking in the OFF position.

### **2.02 MOLDED CASE CIRCUIT BREAKERS**

- A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
- B. Interrupting Capacity:
  - 1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
    - a. 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
    - b. 14,000 rms symmetrical amperes at 480 VAC.
  - 2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
  - 3. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
- C. Conductor Terminations:
  - 1. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
- D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
- E. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.

- F. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install enclosed circuit breakers plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 05 26.

#### **3.02 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

#### **3.03 CLEANING**

- A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

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**SECTION 26 28 16.16  
ENCLOSED SWITCHES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Enclosed safety switches.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 28 13 - Fuses.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) 2013.
- D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- H. UL 98 - Enclosed and Dead-Front Switches Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- C. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

**1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.



- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

## **PART 2 PRODUCTS**

### **2.01 ENCLOSED SAFETY SWITCHES**

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet (2,000 m).
  - 2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
  - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- G. Provide with switch blade contact position that is visible when the cover is open.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- J. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
- K. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- L. Heavy Duty Switches:
  - 1. Comply with NEMA KS 1.
  - 2. Conductor Terminations:
    - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  - 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
- M. General Duty Switches:
  - 1. Conductor Terminations:
    - a. Provide mechanical lugs.
    - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  - 2. Provide externally operable handle with means for locking in the OFF position, capable of accepting two padlocks.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install enclosed switches plumb.

- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 05 26.

### **3.02 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

### **3.03 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

### **3.04 CLEANING**

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

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**SECTION 26 43 00  
SURGE PROTECTIVE DEVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surge protective devices for branch panelboard locations.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 24 16 - Panelboards.

**1.03 REFERENCE STANDARDS**

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 1449 - Standard for Surge Protective Devices Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

**1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

**1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Store in a clean, dry space in accordance with manufacturer's written instructions.

**1.08 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

**PART 2 PRODUCTS**

**2.01 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS**

- A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.
- B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mounted SPDs.
- C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.
- D. Protected Modes:
- E. UL 1449 Voltage Protection Ratings (VPRs):
- F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.
- G. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

**END OF SECTION**

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**SECTION 26 51 00  
INTERIOR LIGHTING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.
- E. Accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- B. Section 26 05 33.16 - Boxes for Electrical Systems.
- C. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
- D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26 09 23 - Lighting Control Devices.
  - 1. Includes automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.
  - 2. Includes lighting contactors.
- F. Section 26 27 26 - Wiring Devices: Manual wall switches and wall dimmers.
- G. Section 26 56 00 - Exterior Lighting.

**1.03 REFERENCE STANDARDS**

- A. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems 2006.
- B. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems 2006.
- C. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Disharge Ballasts 2020.
- D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 924 - Emergency Lighting and Power Equipment Current Edition, Including All Revisions.
- G. UL 1598 - Luminaires Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
  - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
  - 3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
  - 4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
- C. Field quality control reports.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

### **1.07 DELIVERY, STORAGE, AND PROTECTION**

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

### **1.08 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

### **1.09 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide 3-year manufacturer warranty for LED luminaires, including drivers.
- C. Provide 5-year pro-rata warranty for batteries for emergency lighting units.
- D. Provide 10-year pro-rata warranty for batteries for self-powered exit signs.

## **PART 2 PRODUCTS**

### **2.01 LUMINAIRE TYPES**

- A. Furnish products as indicated in luminaire schedule included on the drawings.

### **2.02 LUMINAIRES**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

### **2.03 EMERGENCY LIGHTING UNITS**

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- C. Battery:
  - 1. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- E. Provide low-voltage disconnect to prevent battery damage from deep discharge.
- F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.
- G. Accessories:
  - 1. Provide compatible accessory mounting brackets where indicated or required to complete installation.

### **2.04 EXIT SIGNS**

- A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
  - 1. Number of Faces: Single- or double-face as indicated or as required for installed location.
  - 2. Directional Arrows: As indicated or as required for installed location.
- B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
  - 1. Self-Powered Exit Signs:
    - a. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
    - b. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
    - c. Provide low-voltage disconnect to prevent battery damage from deep discharge.
    - d. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.
- C. Self-Luminous Exit Signs: Internally illuminated by tritium gas sealed inside phosphor-lined gas tubes, requiring no electrical power or batteries to operate, and with a service life of 20 years unless otherwise indicated.
- D. Photoluminescent Exit Signs: Illuminated with photoluminescent-pigmented material for emergency illumination, activated by ambient light, and requiring no electrical power or batteries to operate.
- E. Powered Photoluminescent Exit Signs: Illuminated with photoluminescent-pigmented material for emergency illumination, activated by ambient light and auxiliary integral LED illumination, and requiring no batteries to operate.
- F. Accessories:
  - 1. Provide compatible accessory high-impact polycarbonate vandal shields where indicated.



## **2.05 BALLASTS AND DRIVERS**

- A. Manufacturers:
  - 1. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
- B. Ballasts/Drivers - General Requirements:
  - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
  - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
  - 3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.
- C. Dimmable LED Drivers:
  - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
  - 2. Control Compatibility: Fully compatible with the dimming controls to be installed.
    - a. Wall Dimmers: See Section 26 27 26.
    - b. Daylighting Controls: See Section 26 09 23.

## **2.06 ACCESSORIES**

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.
- C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### **3.03 INSTALLATION**

- A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Install accessories furnished with each luminaire.
- G. Bond products and metal accessories to branch circuit equipment grounding conductor.
- H. Emergency Lighting Units:

I. Exit Signs:

**3.04 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
- E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

**3.05 ADJUSTING**

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

**3.06 CLEANING**

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

**3.07 CLOSEOUT ACTIVITIES**

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

**3.08 PROTECTION**

- A. Protect installed luminaires from subsequent construction operations.

**END OF SECTION**

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**SECTION 26 56 00  
EXTERIOR LIGHTING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Exterior luminaires.
- B. Ballasts.
- C. Poles and accessories.
- D. Luminaire accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- B. Section 26 05 33.16 - Boxes for Electrical Systems.
- C. Section 26 09 23 - Lighting Control Devices.
  - 1. Includes automatic controls for lighting including outdoor motion sensors, time switches, and outdoor photo controls.
  - 2. Includes lighting contactors.
- D. Section 26 27 26 - Wiring Devices: Receptacles for installation in poles.
- E. Section 26 51 00 - Interior Lighting.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems 2000 (Reaffirmed 2006).
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 1598 - Luminaires Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
  - 2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

**1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
  - 1. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.
- C. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

### **1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

### **1.08 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide 2-year manufacturer warranty for all LED luminaires, including drivers.

## **PART 2 PRODUCTS**

### **2.01 LUMINAIRE TYPES**

- A. Furnish products as indicated in luminaire schedule included on the drawings.

### **2.02 LUMINAIRES**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

### **2.03 BALLASTS AND DRIVERS**

- A. Manufacturers:
  - 1. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.
- B. Ballasts/Drivers - General Requirements:
  - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
  - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- C. Dimmable LED Drivers:
  - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
  - 2. Control Compatibility: Fully compatible with the dimming controls to be installed.

### **2.04 POLES**

- A. All Poles:
  - 1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.

## **2.05 ACCESSORIES**

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.
- C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### **3.03 INSTALLATION**

- A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires in accordance with NECA/IESNA 501.
- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Install accessories furnished with each luminaire.
- G. Bond products and metal accessories to branch circuit equipment grounding conductor.
- H. Install lamps in each luminaire.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

### **3.05 ADJUSTING**

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

### **3.06 CLEANING**

- A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

### **3.07 CLOSEOUT ACTIVITIES**

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

- C. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

**3.08 PROTECTION**

- A. Protect installed luminaires from subsequent construction operations.

**END OF SECTION**

## SECTION 26 60 00 - LABORATORY ELECTRICAL REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The general conditions, Division 1, and Division 26 electrical requirements are part of this section and the contract for this work and apply to this section as fully as if repeated herein.
- B. Reference to other sections: The applicable requirements from all other Division 26 sections shall form a part of the electrical work and each section shall be thoroughly reviewed by the Contractor for application to all other sections. For Laboratory areas only (excluding lab lighting), this section shall take precedence.
- C. Provide complete electrical systems from the laboratory branch circuit panelboards to all devices and equipment as described in these specifications and shown on the Laboratory Electrical drawings. Electrical installations shall include all required hardware, fittings, boxes, mounting provisions and miscellaneous equipment to provide complete and operable systems in accordance with the standard practices of the trade. Materials utilized shall be as defined in other sections of Division 26 of these specifications and modified only as described herein.

#### 1.2 EXPLANATION OF DRAWINGS

- A. The Laboratory Electrical (LE) construction documents are intended to be diagrammatic and reflect the scope, quality, and character of the work to be performed; all miscellaneous materials and work required for a complete and operational system, though not specifically mentioned, shall be furnished and installed by the Contractor.
- B. The Contractor shall confirm sizes, dimensions, weights and locations of all devices, light fixtures, and equipment prior to installation. Dimensioned architectural drawings shall take precedence over diagrammatic layouts shown on these contract documents.
- C. The Contractor shall be responsible for reporting any discrepancies, errors, or omissions regarding the Laboratory Electrical drawings noted prior to bid.
- D. It is the intent of the drawings to indicate schematic routing and placement of devices, fixtures, equipment and conduit. Exact locations shall be dimensioned on other trade documents (architectural, laboratory furnishings, mechanical, etc.). Offsets, elbows, or extensions shall be furnished and installed by the Contractor as necessary to avoid structure, piping, clearances and to provide a complete and workmanlike installation.

#### 1.3 QUALITY ASSURANCE AND STANDARDS

- A. All work, material or equipment shall comply with the codes, ordinances and regulations of the local government having jurisdiction, including the regulations of serving utilities and any participating government agencies having jurisdiction.
- B. All electrical work shall comply with the latest edition under enforcement, including all amendments, modifications, and supplements, of the following codes and standards or other regulations which may apply:
  - 1. American Disabilities Act (ADA)
  - 2. American National Standards Institute (ANSI)
  - 3. American Society for Testing and Materials (ASTM)
  - 4. Institute of Cable Engineers Association (ICEA)
  - 5. Institute of Electrical and Electronics Engineers (IEEE)
  - 6. Local Code Enforcement Agency Requirements



7. National Electrical Code (NEC)
  8. National Electrical Contractor's Association (NECA)
  9. National Electrical Manufacturer's Association (NEMA)
  10. National Electrical Testing Association (NETA)
  11. National Fire Protection Association (NFPA)
  12. Underwriters' Laboratories, Inc. (UL)
  13. International Building Code (IBC)
    - a. No requirement of these drawings and specifications shall be construed to void any of the provisions of the above standards. Any conflicts or changes required to the contract documents in order to obtain compliance with applicable codes shall be brought to the immediate attention of the Engineer, Architect, and Owner's Representative by the Contractor.
- C. All items shall be listed by Underwriter's Laboratories and shall bear the U.L. label.
- D. Equipment shown to scale is approximate only and based upon a general class of equipment specified. The Contractor shall verify all dimensions and clearances prior to commencement of work.
- E. The Contractor shall verify all points of connection with the manufacturer's requirements, instructions, or recommendations prior to installation. The actual dimensions, weights, clearance requirements and installation requirements shall be verified and coordinated by the Contractor.

#### 1.4 SUBMITTALS

- A. Shop drawings for materials, equipment, devices, fixtures, and systems shall be submitted by the Contractor for review in compliance with the requirements of Division 1 and Division 26.
- B. The Contractor shall bear the responsibility for any materials installed which were not submitted for review or not installed in compliance with the review comments and the contract documents.
- C. Verbal modification of submittal documents or changes to the requirements of the contract documents shall not be acceptable. All submittal material must be documented in a written format.
- D. All submittal packages must be submitted at one time and in accordance with the specification section appropriate for the material. All packages must be identical and clearly labeled indicating the specification section, project name, submittal date, Contractor's name, Engineer's name, preparer's name and submission version (first submission, resubmittal #1, etc.)
- E. Product catalog cutsheets and descriptive literature shall be cross-referenced to the specification section by paragraph.
- F. All submittal packages shall be permanently bound in brochure or booklet format. A minimum of six submittal booklets shall be provided by the Contractor; additional copies may be required if so noted.
- G. Materials which bear a certification or approval of a testing agency, performance criteria, society, agency, of other organization shall be submitted with all labels identified.
- H. The submittal shall be complete and with catalog data and information properly marked to show, among other things, materials, capacity and performance data to meet the specified requirements.
- I. Incomplete submittals will be rejected at the discretion of the reviewing Engineer.

- J. Review of the submittal is for general conformance with the contract documents. The Contractor is responsible for confirmation and coordination of dimensions, quantities, sizes, fabrication, installation methods, and for coordination of work of other trades with the electrical work.
- K. Submittal brochures shall be complete and descriptive of the type, make, manufacturer, application, quantity, performance, capacity, ratings, options, dimensions, clearances, weights, nameplate data, special installation requirements, mounting method, NEMA type, NEMA class, environmental restrictions, layout requirements or other information as may be necessary for review of the material.
- L. The Contractor shall be responsible for all aspects of substitutions of material including any additional cost or delay incurred as a result of the substitution. The Contractor shall coordinate all substitutions with other trades, verify code compliance, verify clearances, photometric performance, appearance, suitability, constructability, and availability of the material prior to submitting the substitution for review. The Contractor shall bear the responsibility of any increased costs to other trades which are directly related to the substitution.
- M. Submittals shall include the following:
  - 1. Raceways
  - 2. Wire and Cable
  - 3. Boxes
  - 4. Wiring Devices
  - 5. Disconnect Switches
- N. Submit detailed dimensioned drawings for all multi-outlet surface raceways.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. All materials shall be new, of prime quality, listed as suitable for the application, and bear factory-applied U.L. labels.
- B. Materials shall be currently in production and shall be supported by spare parts, repair service, maintenance, and factory technical support

### 2.2 RACEWAYS

- A. Electrical Metallic Tubing (EMT)
  - 1. Conduit shall be cold rolled zinc coated steel and manufactured per UL and ANSI requirements.
  - 2. Fittings for EMT shall be watertight steel or malleable gripping ring compression type.
  - 3. Pressure cast material for nuts of compression ring type fittings and set-screw connections are not acceptable.
  - 4. Minimum raceway size shall be  $\frac{3}{4}$ ".
- B. Flexible Metallic Conduit
  - 1. Flexible conduit shall bear the UL label and be zinc-coated steel.
  - 2. Fittings for flexible metallic conduit shall be steel or malleable iron. Fittings shall clamp to conduit securely.
  - 3. Screw in type, sheet metal or set-screw type fittings are not acceptable.
  - 4. Minimum raceway size shall be  $\frac{3}{4}$ ".

C. Liquid Tight Flexible Conduit

1. Conduit shall be manufactured in accordance with UL and ANSI requirements. Conduit shall be approved for grounding and compatible with approved fittings. Flexible steel conduit shall be hot dipped galvanized with extruded PVC covering manufactured per UL requirements.
2. Fittings shall be liquid tight type with body and gland nut of steel or malleable iron with provisions for grounding flexible conduit to fittings.
3. Minimum raceway size shall be  $\frac{3}{4}$ ".

D. Polyvinyl Chloride (PVC) Conduit

1. PVC shall be constructed of a virgin homopolymer PVC compound and be manufactured according to NEMA and UL specifications. PVC conduit shall be Schedule 40 or 80.
2. Minimum raceway size shall be  $\frac{3}{4}$ ".

E. Multi-outlet Surface Raceways

1. Multi-outlet surface raceways shall be furnished complete with bases, covers, end plates, connectors, wiring devices, receptacles, connectors, and labels as indicated on the drawings and in these specifications. The multi-outlet surface raceways may be factory or field assembled.
2. Mounting of multi-outlet surface raceways shall be according to the manufacturer's recommendations and detailed drawings. Specific fitting of the multi-outlet surface raceways to casework, benches, or walls shall be the responsibility of the Contractor. Coordinate elevations with Laboratory Furnishings drawings and details.
3. Refer to the Laboratory Furnishings drawings and specifications for details in regard to the location, length, and quantity of multi-outlet surface raceways.
4. Multi-outlet surface raceways shall fit the intended space with no more than 1/8 inch clearance between each end of the raceway and the adjacent wall, bench, support riser, end of counter, or other laboratory finish as appropriate.
5. Final multi-outlet surface raceway cuts shall be plumb and straight and shall be finished to eliminate burrs, nicks, or sharp edges on both raceways and covers. Multi-outlet surface raceway field cuts which are not equal to the quality and appearance of the factory cuts will be rejected at the discretion of the Laboratory Engineer or Architect.
6. Provide end plates with conduit knock-outs for the conduit sizes indicated or as required by code.
7. All receptacles in multi-outlet surface raceways shall be wired for the entire length of the raceway section with properly tagged pigtails.
8. The multi-outlet surface raceways shall be U.L. listed assemblies.
9. Multi-outlet surface raceway bases, covers, and end plates shall be constructed of extruded aluminum with 0.094" minimum thickness walls and clear anodized finish. The multi-outlet surface raceway extrusion shall be rectangular in cross section and have no protrusions.
  - a. Dual channel raceways shall be two compartment, factory pre-wired Wiremold AL4520 series; Monosystems, Hubbell, or equal. A continuous, permanently installed metallic barrier shall separate the compartments.
  - b. Single channel raceways shall be one compartment, pre-wired Wiremold ALA3800 series; Monosystems, Hubbell, or equal.
  - c. If alternate product is to be submitted, all material and functional requirements of the specified product must be demonstrated and documented to be equal.

10. Multi-outlet surface raceway covers shall be cut in 12-inch sections with one "filler" section of less than 12 inches at only one end of each run of raceway as required. Receptacle or telecommunications port locations shall only be provided on a 12-inch cover section.
11. Do not scale or dimension Laboratory Electrical drawings to determine raceway lengths. Laboratory Furnishings drawings should be used for this purpose.
12. Provide labeling with panel and circuit number at each receptacle installed in the raceway. Labels may be either engraved phenolic affixed with epoxy, or engraved directly on raceway cover plate. Phenolic labels shall be block with white lettering for normal power receptacles and red with white lettering for standby or emergency power receptacles. Engraved cover plate labels shall have black lettering for normal power receptacles or red lettering for standby or emergency power receptacles.

## 2.3 WIRE AND CABLE

- A. Conductors shall be copper; conductors size #10AWG and smaller shall be solid, conductors size #8AWG and larger shall be stranded. Conductors shall be minimum size #12AWG for power and lighting circuits; control circuits shall use a minimum conductor size of #14AWG.
- B. Insulation shall be type THW or THHN/THWN for all branch circuits up to and including size #2AWG. Insulation for conductors over size #2AWG shall be XHHW.
- C. Jackets shall be nylon or PVC material.
- D. All cables shall be UL listed for the application.
- E. All conductors shall be installed in conduit in the field, unless specifically noted otherwise in these documents. Type AC, type NM and type MC cable are not acceptable.
- F. Multi-conductor flexible cords shall be types SO, SJO, STO, or SJTO.
- G. Connectors shall be UL listed and suitable for the conductor material being connected and rated appropriately. Connectors shall be solderless helical metal spring pressure type or solderless finger metal spring barb type for conductors #10AWG and smaller. Connectors shall be compression type for conductors #8AWG and larger.

## 2.4 BOXES

- A. Boxes shall be flat rolled steel sized as required by code and as suitable for the application. Boxes shall have mounting holes and knock-outs in sides and back. Grounding shall be accommodated by means of threaded holes.
- B. Provide accessories, extension rings, gaskets, supports, trim rings, hangers, straps, and other material as necessary for a complete code complying installation.
- C. Boxes installed outdoors shall be weather-tight, dust-tight, and corrosion resistant. Provide gaskets and conduit hubs.
- D. Provide Type FS boxes for surface mounted applications.
- E. Provide additional support for boxes as necessary when mounting fixtures or devices from boxes.
- F. Provide ganged boxes for multiple switches and devices; provide barriers for boxes served by separate voltages.

## 2.5 WIRING DEVICES

- A. Receptacles
  1. Wiring devices shall be UL listed and suitable for the application.

2. Devices shall be color coded per the system to which they are connected: normal power shall be white; standby or emergency power shall be red; dedicated outlets shall be grey; unless otherwise noted on the construction documents.
  3. Receptacles shall be heavy duty, screw type, side wired, 120V, 20A, duplex type, unless noted otherwise on the construction documents. Verify NEMA configuration with construction documents.
  4. Weathertight receptacles shall be gasketed in cast metal boxes with cast metal coverplates with spring-loaded hinged covers over each opening.
  5. Ground fault interrupting receptacles shall be duplex type and capable of detecting a leaking current of 5mA.
- B. Toggle Switches
1. Toggle wall switches shall be quiet AC type, rated 120/277V, 20A and UL listed for the application.
  2. Switches shall be single pole, double throw with white finish unless noted otherwise.
- C. Coverplates
1. Single, combination coverplates shall be used at all ganged device locations.
  2. Provide stainless steel coverplates with matching screws in laboratory, process, manufacturing, and clean room areas or as noted on the construction documents.
  3. Provide labeling with panel and circuit number at each receptacle coverplate. Labels may be either engraved phenolic affixed with epoxy, or direct factory engraving on the coverplate. Phenolic labels shall be black with white lettering for normal power receptacles and red with white lettering for standby or emergency power receptacles. Engraved cover plate labels shall have black lettering for normal power receptacles or red lettering for standby or emergency power receptacles.

## 2.6 POWER AND TELECOMMUNICATIONS PEDESTALS

- A. Manufacturer
1. WaterSaver pedestal electrical box with 3/4" hub, single-gang catalog number E300SA, two-gang catalog number E400SA and E500SA, and four-gang catalog number E600SA; Hubbell, LeGrand, or equal.
  2. If alternate product is to be submitted, all material and functional requirements of the specified product must be demonstrated and documented to be equal.
- B. Pedestals shall have single-piece aluminum base and housing, integral raised threaded hub, and shall contain devices as shown on drawings. Housing finish shall be brushed.
- C. Faceplates
1. Pedestal receptacle faceplates shall be stainless steel, and shall accommodate the device types and quantities indicated on the drawings. Faceplates shall have engraved labeling with requirements as noted for raceway and coverplate labels.
  2. Pedestal telecommunication faceplates shall be stainless steel, and shall be provided with cutouts specifically designed to accommodate the type of tel/data devices to be installed by the telecommunications/data system installer. Coordinate prior to ordering faceplates.

## 2.7 DISCONNECT SWITCHES

- A. Disconnects shall NEMA 1, indoor type, or rated for the locations in which they are installed as noted on the construction documents.
- B. Disconnects shall be UL listed and suitable for the application.

- C. Disconnects in exterior, wet, cold, warm, or hot environments shall be raintight, have raintight hubs, and be rated NEMA 3R.
- D. Disconnects shall be heavy duty type, rated 600V with current capacity as noted on the construction documents. Verify NEMA configuration with construction documents.
- E. Disconnects shall have hinged, lockable, dead-front doors with permanently marked ON/OFF indicators. Enclosures shall be baked enamel factory painted steel with conduit knockouts.
- F. Disconnects shall be operated by a handle accessible from the exterior of the enclosure. Handles shall have provision to be padlocked in the OFF position.
- G. All current carrying parts shall be high conductivity copper designed to carry rated load without damage from heat and plated to resist corrosion.
- H. Switch mechanism shall be a quick-make, quick-break type such that the operation of the contact is restrained by the handle during the closing or opening operation.
- I. Switches shall have a minimum fault current rating of 200,000A RMS.
- J. All switches shall be fused unless specifically noted otherwise.
- K. The disconnect door cover shall have an interlocking mechanism to prevent opening the cover when the switch is in the ON position.
- L. Fuses serving motor loads shall be Class L and Class RK1, 250V and 600V, time delay, dual element unless noted otherwise on the construction documents.
- M. Fuses serving non-motor loads shall be Class L and Class RK1, 250V and 600V, fast acting, dual element unless noted otherwise on the construction documents.
- N. Provide built-in fuse pullers.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION REQUIREMENTS

- A. All laboratory electrical work shall conform to National Electrical Contractors Association standards of installation and the requirements of the manufacturer, Division 1, Division 26, and the Owner's Representative.
- B. The Contractor shall field-verify all dimensions and coordinate dimensions with equipment sizes and locations.
- C. The Contractor shall coordinate and install all penetrations, openings, slots, chases, or sleeves as necessary for the routing and installation of laboratory electrical equipment. The Contractor shall provide approved fire sealant to maintain fire ratings at all penetrations.
- D. The Contractor shall coordinate and cooperate with all other trades for a successful completion of the laboratory electrical work.
- E. The Contractor shall install access panels in walls or ceilings in coordination with the Architect for all laboratory electrical equipment, which require access.
- F. All laboratory electrical equipment shall be installed plumb, parallel, or orthogonal to structure and in a neat orderly fashion. All material shall be accessible for maintenance, inspection, servicing or replacement.
- G. Verify final locations for laboratory electrical devices and equipment during the rough-in phase with dimensioned architectural drawings, fabrication drawings, or other space planning requirements included in the contract documents.
- H. The Contractor shall provide adequate and qualified supervision for the work performed; no work shall be performed without the supervision of a representative of the Contractor.

### 3.2 GROUNDING AND BONDING

#### A. Special Cabinets

1. At all flammable materials storage cabinets, solvent storage cabinets, corrosive storage cabinets and gas safety cabinets, provide a (minimum) #12 AWG copper, insulated green grounding conductor from the equipment grounding conductor of the nearest available 120 volt circuit outlet box.
2. Extend cabinet bonding conductor from the nearest circuit outlet box via 1/2" conduit concealed in wall and stubbed out behind the respective cabinet. Conduit shall be converted to flexible metal conduit where exposed, and shall terminate with a UL listed bushing. Where indicated on the drawings, provide a flush wall box with cover plate (with grommated hole, 1/2" diameter) and extend bonding conductor from wall box to equipment terminal.
3. The bonding conductor shall be secured to the bonding terminal of the cabinet. If the cabinet is not equipped with a bonding terminal, provide a UL listed screw terminal and permanently secure it to the metallic cabinet with a screw, lockwasher and bolt. Self-tapping sheet metal screws will not be accepted as the means of attachment.
4. Refer to the Lab Furnishings (LF) specifications and drawings for cabinet specs, details, quantities and locations. Bonding shall be provided at each cabinet whether or not specifically indicated at each cabinet location.

#### B. Grounding Bus

1. Where indicated on the drawings, provide copper bus bar assemblies, wall mounted on insulator bushings, secured to the building framing structures.
2. For each area containing a ground bus bar system, provide a dedicated conduit homerun to the respective branch circuit panel serving the area. Install an insulated copper grounding conductor (green color).
3. Provide listed fittings, nuts, bolts, connectors and miscellaneous hardware for a complete ground bus system.

### 3.3 COMMISSIONING

- A. The Contractor shall initiate start-up of all laboratory electrical equipment including operation of all devices, switches, overcurrent protection, disconnect switches, etc. to verify normal operation of all moving parts and electrical performance.
- B. The Contractor shall test, adjust, align, label, clean and complete all systems prior to acceptance by the Owner's Representative.
- C. The Contractor shall demonstrate that all systems operate within the manufacturer's recommended performance characteristics, the laboratory electrical construction documents, system requirements, and Owner requirements.
- D. The Contractor shall test each laboratory electrical system per the manufacturer's requirements and shall perform the following system tests:
  1. Inspect cables for physical damage and proper connection.
  2. Torque test cable connection and tighten in accordance with termination manufacturers recommendations.
  3. Infrared scan all connections under loaded conditions and provide color printed images.
  4. Insulation resistance test of each cable.
  5. Inspect ground system connections.
  6. Voltage drop tests on the main grounding electrode of system.

7. Determine the ground resistance between the main grounding system and all major electrical equipment frames, system neutral points.
8. Check rated voltage and phase balance at all equipment, motors and selected devices at full load conditions. Measure no load voltage conditions at each location.
9. Furnish all material, equipment, instruments and labor as required to complete testing.
10. Provide all test results properly bound in a three-ring binder.

### 3.4 CLEANING

- A. Contractor shall clean all equipment, conduit interiors, fixtures, devices, etc. of all extraneous paint, drywall mud, overspray, dust, dirt, debris, trash, grease or markings. All cleaning shall be performed by the Contractor in accordance with the appropriate manufacturer's recommendations.

### 3.5 RACEWAYS

- A. EMT shall be run indoors concealed in drywall type construction, above suspended ceilings, or in utility chases at casework or lab benches. In unfinished indoor areas, EMT shall be run exposed no less than 8'0" above finished floor.
- B. EMT shall not be installed underground or embedded in concrete.
- C. Flexible conduit shall not exceed 6'0" in length.
- D. Flexible conduit used for final connection to laboratory equipment shall not exceed 2'0" in length.
- E. The conduit grounding system shall be continuous as recommended by the manufacturer and UL approved.
- F. Liquidtight flexible conduit shall be used for final connection to machines, motors, transformers and equipment that requires vibration isolation.
- G. Liquidtight flexible conduit shall be used for final connection to equipment in wet or damp locations or where exposed to grease, water, dust, dirt, pathogens, vapors, or chemicals.

### 3.6 WIRE AND CABLE

- A. All wiring methods shall comply with the latest enforced edition of the National Electrical Code and the local authority having jurisdiction.
- B. Conductors shall be installed in clean raceways using nylon cord, polypropylene cord, hemp rope, or other material, which will not damage the conductors or conduit. Do not use metal fish tape. Use lubricant when necessary for pulling.
- C. Conductors shall be pulled into conduit simultaneously so as to not damage conductors during pulling.
- D. Conductors installed at outlets and switches shall have a minimum of 6" pigtail left in the box for future connections. All conductors not connected to devices shall be terminated with splice caps and tape.
- E. Conductors shall be terminated such that no copper material is exposed. Conductors shall be trained and labeled at terminations in a neat and workmanlike manner.
- F. All terminations shall be mechanically sound, featuring helical twisting of the terminating conductors prior to the application of an electrical connector. The electrical connector shall not be used for the mechanical connection of the conductors.
- G. All terminations shall comply with the manufacturer's installation and torquing requirements.
- H. Splices on conductors #10AWG and smaller shall be made with splice caps twisted onto the conductors. Tape all splices.



- I. Splices on conductors #8AWG and larger shall be made with pressure connectors and terminal lugs. Where exposed to water, damp air, or moisture, splices shall be watertight.
- J. Splices shall not be made in feeders; splices to branch circuits shall not be made within panelboards or similar enclosures.
- K. When combining homeruns, the Contractor shall derate all conductors per code requirements including reducing the ampacity, using high temperature insulation where necessary. Conduit sizes shall be adjusted by the Contractor as suitable for the conductor revisions.
- L. The Contractor shall provide a code-sized insulated ground conductor, in addition to the feeder conductors indicated on the drawings, where non-metallic conduit is used.
- M. Conductors shall be color-coded as follows or as matches the building standard:

208Y/120V	Phase	480Y/277V
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray
Green	Ground	Green
- N. Where tape or labels are used for color-coding, apply material at each end of the conductor, splices, boxes, and all terminations.

### 3.7 BOXES

- A. All box installation methods shall comply with the latest enforced edition of the National Electrical Code and the authority having jurisdiction.
- B. Install all boxes plumb, square, and securely fastened to structure.
- C. Boxes shall be placed such that they are readily accessible.
- D. Cover or plug all unused openings in boxes where knockout blanks have been removed.
- E. Install boxes such that they are flush with the finished surface of the wall or surface within which they are mounted.
- F. Install all boxes at mounting heights per architectural, electrical code, and ADA requirements.
- G. Boxes shall not be mounted back to back in walls.
- H. Boxes in sealed environments shall be sealed with an approved sealant suitable for the application.
- I. Boxes penetrating fire rated walls or surfaces shall be sealed with a Fire Marshal approved fire sealant to maintain the fire rating of the wall or surface.
- J. Boxes located above inaccessible ceilings shall be made accessible by means of access doors or hatches in the ceiling.
- K. Install all boxes per manufacturer's recommendations and requirements.
- L. Provide for ground continuity at all boxes.

### 3.8 WIRING DEVICES

- A. Installation methods for wiring devices shall comply with the latest enforced edition of the National Electrical Code and the local authority having jurisdiction.
- B. Install all devices in accordance with the manufacturer's recommendations and requirements.

- C. Coordinate device mounting height, location and type with architectural and interior drawings. Coordinate with other trades to identify conflicts with device locations and notify the Engineer of any conflicts.
- D. Install devices only in clean boxes.
- E. Install all trim rings and coverplates in coordination with other trades and their installation schedules.
- F. Tighten and inspect all connections prior to covering devices and reconnect or repair wiring as necessary.
- G. Test all devices for voltage level, continuity, ground fault, and short circuits.
- H. Install all devices plumb and square to structure and adjacent surfaces.
- I. Connect and inspect all ground bonds prior to covering device.
- J. Demonstrate the proper operation of all ground fault interrupting devices.

### 3.9 DISCONNECT SWITCHES

- A. Installation methods for disconnects shall comply with the latest enforced edition of the National Electrical Code and the local authority having jurisdiction.
- B. Install all disconnects in accordance with the manufacturer's recommendations and requirements.
- C. Coordinate disconnect mounting height, location and type with architectural and interior drawings. Coordinate with other trades to identify conflicts with device locations and notify the Engineer of any conflicts. Mount switches 42" above finished floor unless noted otherwise.
- D. Provide suitable galvanized metal strut framework where no wall or structure is available for the mounting of disconnects.
- E. Provide flexible conduit connections for disconnects mounted to strut framework, motors, or vibrating equipment.
- F. Tighten and inspect all connections and reconnect or repair wiring as necessary.
- G. Test all disconnects for voltage level, continuity, ground fault, and short circuits. Check switch mechanism operation under no load conditions prior to operating under load.
- H. Install all disconnects plumb and square to structure and adjacent surfaces.
- I. Provide and install all fuses sized per the equipment manufacturer's recommendation.

END OF SECTION

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**SECTION 27 05 29**  
**HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other communications work.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 27 05 33.13 - Conduit for Communications Systems: Additional support and attachment requirements for conduits.
- D. Section 27 10 00 - Structured Cabling.

**1.03 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.
- D. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition 2022.
- E. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition 2019.
- F. MFMA-4 - Metal Framing Standards Publication 2004.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. TIA-569 - Telecommunications Pathways and Spaces 2019e.
- J. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
  - 2. Coordinate work to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
  - 4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
  - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 30 00.

## **1.05 QUALITY ASSURANCE**

### **PART 2 PRODUCTS**

#### **2.01 SUPPORT AND ATTACHMENT COMPONENTS**

- A. General Requirements:
  - 1. Comply with the following. Where requirements differ, comply with most stringent.
    - a. TIA-569.
    - b. NFPA 70.
    - c. Requirements of authorities having jurisdiction.
  - 2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of communications work.
  - 3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
  - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
  - 5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
  - 6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
    - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit Supports: Straps and clamps suitable for conduit to be supported.
  - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
  - 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Cable Supports: Suitable for cables to be supported, including but not limited to J-hooks, bridle rings, drive rings, and flexible harnesses/slings.
  - 1. Comply with TIA-569.
  - 2. Cable Supports Installed in Spaces Used for Environmental Air: Plenum rated; listed and labeled as complying with UL 2043, suitable for use in air-handling spaces.
- D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
- E. Metal Channel/Strut Framing Systems:
  - 1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
  - 2. Comply with MFMA-4.
- F. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
- G. Anchors and Fasteners:
  - 1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install hangers and supports in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
  - 1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
  - 2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Secure fasteners in accordance with manufacturer's recommended torque settings.
- I. Remove temporary supports.

**3.02 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

**END OF SECTION**

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**SECTION 27 05 33.13**  
**CONDUIT FOR COMMUNICATIONS SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Galvanized steel rigid metal conduit (RMC).
- B. Flexible metal conduit (FMC).
- C. Liquidtight flexible metal conduit (LFMC).
- D. Galvanized steel electrical metallic tubing (EMT).
- E. Aluminum electrical metallic tubing (EMT).
- F. Rigid polyvinyl chloride (PVC) conduit.
- G. Electrical nonmetallic tubing (ENT).

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 27 10 00 - Structured Cabling.

**1.03 REFERENCE STANDARDS**

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2020.
- C. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition 2022.
- D. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition 2019.
- E. BICSI TDMM - Telecommunications Distribution Methods Manual, 14th Edition 2020.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- G. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2020.
- H. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2017.
- I. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- J. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit 2020.
- K. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing 2021.
- L. NEMA TC 13 - Electrical Nonmetallic Tubing (ENT) 2014 (Reaffirmed 2019).
- M. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. TIA-568.0 - Generic Telecommunications Cabling for Customer Premises 2020e.
- O. TIA-569 - Telecommunications Pathways and Spaces 2019e.
- P. UL 1 - Flexible Metal Conduit Current Edition, Including All Revisions.
- Q. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.
- R. UL 360 - Liquid-Tight Flexible Metal Conduit Current Edition, Including All Revisions.
- S. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.
- T. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings Current Edition, Including All Revisions.
- U. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.
- V. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel Current Edition, Including All Revisions.



- W. UL 1653 - Electrical Nonmetallic Tubing Current Edition, Including All Revisions.
- X. UL 2024 - Standard for Cable Routing Assemblies and Communications Raceways Current Edition, Including All Revisions.
- Y. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate minimum sizes of conduits with actual type and quantity of cables to be installed.
  - 2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts.
  - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
  - 4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
  - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not begin installation of communications cables until installation of conduit between termination points is complete.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

#### **1.06 QUALITY ASSURANCE**

- A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 CONDUIT APPLICATIONS**

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, TIA-569, BICSI ITSIMM, BICSI TDMM, manufacturers' instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

#### **2.02 CONDUIT - GENERAL REQUIREMENTS**

- A. Comply with NFPA 70 and TIA-569.
- B. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.
- C. Provide conduit, fittings, supports, and accessories required for complete communications pathway.
- D. Provide products listed, classified, and labeled as suitable for purpose intended.
- E. Minimum Conduit Size, Unless Otherwise Indicated:
  - 1. Communications Outlet Box: 3/4-inch (21 mm) trade size.

2. Continuous Conduit Homerun Serving One Communications Outlet Box: 1-inch (27 mm) trade size.
  3. Continuous Conduit Homerun Serving Two Communications Outlet Boxes: 1-inch (27 mm) trade size.
  4. Continuous Conduit Homerun Serving Three Communications Outlet Boxes: 1-1/4-inch (35 mm) trade size.
- F. Where conduit size is not indicated, size to comply with NFPA 70, TIA-569, and BICSI TDMM, but not less than applicable minimum size requirements specified. Where specified standards differ, comply with most stringent.

### **2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
  2. Material: Use steel or malleable iron.
  3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
  4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    - a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

### **2.04 FLEXIBLE METAL CONDUIT (FMC)**

- A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.
- B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.
  3. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

### **2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)**

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.
  3. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    - a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

### **2.06 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.
  3. Connectors and Couplings: Use compression/gland or set-screw type.
    - a. Do not use indenter type connectors and couplings.
  4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.

- a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

## **2.07 ALUMINUM ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: NFPA 70, Type EMT aluminum electrical metallic tubing listed and labeled as complying with UL 797A.
- B. Fittings:
  1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; listed for use with aluminum EMT.
  2. Material: Use aluminum.
  3. Connectors and Couplings: Use compression/gland or set-screw type.
    - a. Do not use indenter type connectors and couplings.
  4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    - a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

## **2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT**

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage.
- B. Fittings:
  1. Manufacturer: Same as manufacturer of conduit to be connected.
  2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.
  3. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    - a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

## **2.09 ELECTRICAL NONMETALLIC TUBING (ENT)**

- A. Description: NFPA 70, Type ENT electrical nonmetallic tubing complying with NEMA TC 13 and listed and labeled as complying with UL 1653.
- B. Fittings:
  1. Manufacturer: Same as manufacturer of ENT to be connected.
  2. Use solvent-welded type fittings.
  3. Solvent-Welded Fittings: Rigid PVC fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; suitable for use with ENT.

## **2.10 ACCESSORIES**

- A. Inside-Plant Fabric Innerduct: Listed as complying with UL 2024; plenum rated.
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).
- E. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install galvanized steel electrical metallic tubing (EMT) in accordance with NECA 101.

- E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- F. Install electrical nonmetallic tubing (ENT) in accordance with NECA 111.
- G. Conduit Routing:
  - 1. Conceal conduits unless specifically indicated to be exposed.
  - 2. Conduits in the following areas may be exposed, unless otherwise indicated:
    - a. Electrical rooms.
    - b. Mechanical equipment rooms.
    - c. Within joists in areas with no ceiling.
  - 3. Unless otherwise approved, do not route exposed conduits:
- H. Conduit Support:
  - 1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction.
  - 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- I. Connections and Terminations:
  - 1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
  - 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
  - 3. Use suitable adapters where required to transition from one type of conduit to another.
  - 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
  - 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
  - 6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect cables.
  - 7. Secure joints and connections to provide mechanical strength and electrical continuity.
- J. Penetrations:
  - 1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
  - 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
  - 3. Provide sleeves and/or slots for penetrations as indicated or as required to facilitate installation.
  - 4. Conceal bends for conduit risers emerging above ground.
  - 5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
  - 6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
  - 7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 84 00.
- K. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed cables or connected equipment. This includes, but is not limited to:
  - 1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  - 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
  - 3. Where conduits are subject to earth movement by settlement or frost.
- L. Provide grounding and bonding.

### 3.02 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.

- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective conduits.

**3.03 PROTECTION**

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of cables.

**END OF SECTION**

**SECTION 27 10 00  
STRUCTURED CABLING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Communications system design requirements.
- B. Communications pathways.
- C. Copper cable and terminations.
- D. Fiber optic cable and interconnecting devices.
- E. Communications equipment room fittings.
- F. Communications outlets.
- G. Communications grounding and bonding.
- H. Communications identification.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
  - 1. Includes intersystem bonding termination.
  - 2. Includes bonding jumpers for bonding of communications systems and electrical system grounding.
- C. Section 26 05 36 - Cable Trays for Electrical Systems.
- D. Section 26 05 33.16 - Boxes for Electrical Systems.
- E. Section 26 05 39 - Underfloor Raceways for Electrical Systems.
- F. Section 26 05 53 - Identification for Electrical Systems: Identification products.
- G. Section 27 05 29 - Hangers and Supports for Communications Systems.
- H. Section 27 05 33.13 - Conduit for Communications Systems.

**1.03 REFERENCE STANDARDS**

- A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition 2019.
- B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment 2005e.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices 1988a (Reaffirmed 2012).
- E. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set 2020.
- F. TIA-569 - Telecommunications Pathways and Spaces 2019e.
- G. TIA-606 - Administration Standard for Telecommunications Infrastructure 2021d.
- H. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises 2019d.
- I. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
  - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.

3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- C. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
- D. Evidence of qualifications for installer.
- E. Field Test Reports.
- F. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

#### **1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.
- B. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
  1. Supervisors and installers factory certified by manufacturers of products to be installed.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Keep stored products clean and dry.

### **PART 2 PRODUCTS**

#### **2.01 SYSTEM DESIGN**

- A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
  1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
  2. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
  3. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
  4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.
- B. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
  1. Locate main distribution frame as indicated on the drawings.
- C. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

#### **2.02 PATHWAYS**

- A. Conduit: See section 27 05 33.13.

B. Cable Trays: See Section 26 05 36.

## **2.03 COPPER CABLE AND TERMINATIONS**

A. Manufacturers:

1. CommScope: [www.commscope.com/#sle](http://www.commscope.com/#sle).
2. General Cable Technologies Corporation: [www.generalcable.com/#sle](http://www.generalcable.com/#sle).
3. Siemon Company: [www.siemon.com/#sle](http://www.siemon.com/#sle).
4. Approved UL listed cables not listed above.
5. Substitutions: See Section 01 60 00 - Product Requirements.

## **2.04 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES**

A. Manufacturers:

1. CommScope; [\_\_\_\_\_]: [www.commscope.com/#sle](http://www.commscope.com/#sle).
2. General Cable Technologies Corporation; [\_\_\_\_\_]: [www.generalcable.com/#sle](http://www.generalcable.com/#sle).
3. Siemon Company; [\_\_\_\_\_]: [www.siemon.com/#sle](http://www.siemon.com/#sle).
4. Approved UL listed fiber cabling not listed above.

B. Fiber Optic Interconnecting Devices:

1. Connector Type: Type LC.
2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
3. Maximum Attenuation/Insertion Loss: 0.3 dB.

## **2.05 COMMUNICATIONS EQUIPMENT ROOM FITTINGS**

A. Copper Cross-Connection Equipment:

1. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
2. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
  - a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
  - b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
  - c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
  - d. Provide incoming cable strain relief and routing guides on back of panel.

B. Fiber Optic Cross-Connection Equipment:

1. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum.
  - a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adaptors per standard panel width.
  - b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
  - c. Provide incoming cable strain relief and routing guides on back of panel.
  - d. Provide rear cable management tray at least 8 inches (203 mm) deep with removable cover.
  - e. Provide dust covers for unused adapters.

C. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.

1. Do not paint over UL label.

D. Equipment Frames, Racks and Cabinets:

1. Component Racks: EIA/ECA-310 standard 19 inch (482.6 mm) wide.
2. Wall Mounted Racks: Steel construction, hinged to allow access to back of installed components.



3. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.

E. Cable Management:

**2.06 COMMUNICATIONS OUTLETS**

- A. Outlet Boxes: Comply with Section 26 05 33.16.
  1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
  2. Minimum Size, Unless Otherwise Indicated:
    - a. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.
- B. Wall Plates:
  1. Comply with system design standards and UL 514C.
  2. Accepts modular jacks/inserts.
  3. Capacity:
    - a. Data or Combination Voice/Data Outlets: 2 ports.
  4. Wall Plate Material/Finish - Flush-Mounted Outlets: High impact thermoplastic, color to be selected.

**2.07 GROUNDING AND BONDING COMPONENTS**

- A. Comply with TIA-607.

**2.08 IDENTIFICATION PRODUCTS**

- A. Comply with TIA-606.

**2.09 SOURCE QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Factory test cables according to TIA-568 (SET).

**PART 3 EXECUTION**

**3.01 INSTALLATION - GENERAL**

- A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
- B. Comply with Communication Service Provider requirements.
- C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

**3.02 INSTALLATION OF PATHWAYS**

- A. Install pathways with the following minimum clearances:
  1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
  2. 12 inches (300 mm) from power conduits and cables and panelboards.
  3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
  4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.
- B. Outlet Boxes:
  1. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of telecommunications outlets provided under this section.

**3.03 INSTALLATION OF EQUIPMENT AND CABLING**

- A. Cabling:
  1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
  2. Do not over-cinch or crush cables.
  3. Do not exceed manufacturer's recommended cable pull tension.

4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
- B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
  1. At Distribution Frames: 120 inches (3000 mm).
  2. At Outlets - Optical Fiber: 39 inches (1000 mm).
- C. Fiber Optic Cabling:
  1. Prepare for pulling by cutting outer jacket for 10 inches (250 mm) from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
  2. Support vertical cable at intervals as recommended by manufacturer.
- D. Wall-Mounted Racks and Enclosures:
  1. Install to plywood backboards only, unless otherwise indicated.
  2. Mount so height of topmost panel does not exceed 78 inches (1980 mm) above floor.
- E. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.
- F. Identification:
  1. Use wire and cable markers to identify cables at each end.
  2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
  3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

#### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Comply with inspection and testing requirements of specified installation standards.
- C. Visual Inspection:
  1. Inspect cable jackets for certification markings.
  2. Inspect cable terminations for color coded labels of proper type.
  3. Inspect outlet plates and patch panels for complete labels.
- D. Testing - Fiber Optic Cabling:
- E. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

#### **END OF SECTION**

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**SECTION 28 46 00  
FIRE DETECTION AND ALARM**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fire alarm system design and installation, including all components, wiring, and conduit.
- B. Transmitters for communication with supervising station.
- C. Circuits from protected premises to supervising station, including conduit.
- D. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.
- E. Maintenance of fire alarm system under contract for specified warranty period.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping: Materials and methods for work to be performed by this installer.
- B. Section 08 33 23 - Overhead Coiling Doors: Coiling fire doors to be released by fire alarm system.
- C. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.
- D. Section 23 33 00 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.
- E. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems: Requirements for the seismic qualification of equipment specified in this section.
- F. Section 27 51 29.13 - Rescue Assistance Signal Systems: Two-way emergency communication systems for areas of refuge/rescue assistance.

**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. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits 2002 (Corrigendum 2012).
- D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 72 - National Fire Alarm and Signaling Code Most Recent Edition Cited by Referring Code or Reference Standard.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Proposal Documents: Submit the following with cost/time proposal:
  - 1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
  - 2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
  - 3. Certification by Contractor that the system design will comply with Contract Documents.
  - 4. Proposed maintenance contract.
- C. Evidence of designer qualifications.
- D. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
  - 1. Copy (if any) of list of data required by authority having jurisdiction.
  - 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.

3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
  4. System zone boundaries and interfaces to fire safety systems.
  5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
  6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
  7. List of all devices on each signaling line circuit, with spare capacity indicated.
  8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
  9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
  10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
  11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
  12. Certification by Contractor that the system design complies with Contract Documents.
  13. Do not show existing components to be removed.
- E. Evidence of installer qualifications.
- F. Evidence of instructor qualifications; training lesson plan outline.
- G. Evidence of maintenance contractor qualifications, if different from installer.
- H. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
  2. Submit documentation of satisfactory inspections and tests.
  3. Submit NFPA 72 "Inspection and Test Form," filled out.
- I. Operating and Maintenance Data: See Section 01 78 00 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
  2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
  3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
  4. List of recommended spare parts, tools, and instruments for testing.
  5. Replacement parts list with current prices, and source of supply.
  6. Detailed troubleshooting guide and large scale input/output matrix.
  7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
  8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.
- J. Project Record Documents: See Section 01 78 00 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
  2. "As installed" wiring and schematic diagrams, with final terminal identifications.
  3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- K. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.

2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
- L. Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.
  1. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.

#### **1.05 QUALITY ASSURANCE**

- A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.
- B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
  1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
  2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
  3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
- C. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.
- D. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.06 WARRANTY**

- A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.
- B. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Fire Alarm Control Units and Accessories:
  1. Honeywell Security & Fire Solutions/Gamewell-FCI: [www.gamewell-fci.com/#sle](http://www.gamewell-fci.com/#sle).
  2. Honeywell Security & Fire Solutions/Notifier: [www.notifier.com/#sle](http://www.notifier.com/#sle).
  3. Honeywell Security & Fire Solutions/Silent Knight: [www.silentknight.com/#sle](http://www.silentknight.com/#sle).
  4. Honeywell Security & Fire Solutions/Vista: [www.security.honeywell.com/#sle](http://www.security.honeywell.com/#sle).
  5. National Time & Signal: [www.natsco.net/#sle](http://www.natsco.net/#sle).
  6. Potter Electric Signal Company: [www.pottersignal.com/#sle](http://www.pottersignal.com/#sle).
  7. Siemens Building Technologies, Inc: [www.usa.siemens.com/#sle](http://www.usa.siemens.com/#sle).
  8. Simplex, a brand of Johnson Controls: [www.simplex-fire.com/#sle](http://www.simplex-fire.com/#sle).
  9. Provide control units made by the same manufacturer.
- B. Substitutions: See Section 01 60 00 - Product Requirements.
  1. For other acceptable manufacturers of control units specified, submit product data showing equivalent features and compliance with Contract Documents.

#### **2.02 FIRE ALARM SYSTEM**

- A. Fire Alarm System: Provide a new automatic fire detection and alarm system:

1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
2. Protected Premises: Entire building shown on drawings.
3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
  - a. ADA Standards.
  - b. The requirements of the local authority having jurisdiction , which is [\_\_\_\_\_].
  - c. Applicable local codes.
  - d. Contract Documents (drawings and specifications).
  - e. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
5. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
6. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
7. Program notification zones and voice messages as directed by Owner.
8. Fire Command Center: Location indicated on drawings.
9. Fire Alarm Control Unit: New, located at fire command center.
- B. Supervising Stations and Fire Department Connections:
  1. Public Fire Department Notification: By on-premises supervising station.
  2. On-Premises Supervising Station: Existing proprietary station operated by Owner, located at Facilities..
  3. Means of Transmission to On-Premises Supervising Station: Directly connected noncoded system.
  4. Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), [\_\_\_\_\_].
- C. Circuits:
  1. Initiating Device Circuits (IDC): Class B, Style A.
  2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
  3. Notification Appliance Circuits (NAC): Class B, Style W.
- D. Spare Capacity:
  1. Initiating Device Circuits: Minimum 25 percent spare capacity.
  2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
  3. Speaker Amplifiers: Minimum 25 percent spare capacity.
  4. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.
- E. Power Sources:
  1. Primary: Dedicated branch circuits of the facility power distribution system.
  2. Secondary: Storage batteries.
  3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
  4. Each Computer System: Provide uninterruptible power supply (UPS).

## 2.03 EXISTING COMPONENTS

- A. On-Premises Supervising Station: Include as part of this work all modifications necessary to existing supervising station to accommodate new fire alarm work.
- B. Clearly label components that are "Not In Service."
- C. Remove unused existing components and materials from site and dispose of properly.

## **2.04 FIRE SAFETY SYSTEMS INTERFACES**

- A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
  - 1. Sprinkler water control valves.
  - 2. Dry-pipe sprinkler system pressure.
  - 3. Dry-pipe sprinkler valve room low temperature.
- B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
  - 1. Sprinkler water flow.
- C. HVAC:
  - 1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

## **2.05 COMPONENTS**

- A. General:
  - 1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
  - 2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
- B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.
- C. Master Control Unit: [\_\_\_\_\_].
- D. Initiating Devices:
  - 1. Addressable Systems:
    - a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
    - b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
- E. Notification Appliances:
- F. Circuit Conductors: Copper or optical fiber; provide 200 feet (60 m) extra; color code and label.
- G. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
- H. Locks and Keys: Deliver keys to Owner.
- I. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
  - 1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
  - 2. Provide one for each control unit where operations are to be performed.
  - 3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
  - 4. Provide extra copy with operation and maintenance data submittal.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.
- B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- C. Obtain Owner's approval of locations of devices, before installation.
- D. Install instruction cards and labels.

### **3.02 INSPECTION AND TESTING FOR COMPLETION**

- A. Notify Owner 7 days prior to beginning completion inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.



- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- E. Provide all tools, software, and supplies required to accomplish inspection and testing.
- F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

### **3.03 OWNER PERSONNEL INSTRUCTION**

- A. Provide the following instruction to designated Owner personnel:
  - 1. Hands-On Instruction: On-site, using operational system.
- B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
  - 1. Initial Training: 1 session pre-closeout.
- C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
  - 1. Initial Training: 1 session pre-closeout.
- D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

### **3.04 CLOSEOUT**

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
  - 1. Be prepared to conduct any of the required tests.
  - 2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
  - 3. Have authorized technical representative of control unit manufacturer present during demonstration.
  - 4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
  - 5. Repeat demonstration until successful.
- B. Occupancy of the project will not occur prior to Substantial Completion.
- C. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
  - 1. Approved operating and maintenance data has been delivered.
  - 2. Spare parts, extra materials, and tools have been delivered.
  - 3. All aspects of operation have been demonstrated to Owner.
  - 4. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
  - 5. Specified pre-closeout instruction is complete.

### **3.05 MAINTENANCE**

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.
- B. Provide to Owner, a proposal as an alternate to the base bid, for a maintenance contract for entire warranty period, to include the work described below; include the total cost of contract, proposal to be valid at least until 30 days after date of Substantial Completion.
- C. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
  - 1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.

2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
  3. Record keeping required by NFPA 72 and authorities having jurisdiction.
- D. Provide trouble call-back service upon notification by Owner:
1. Provide on-site response within 2 hours of notification.
  2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
  3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.
- E. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.
- F. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.
- G. Comply with Owner's requirements for access to facility and security.

**END OF SECTION**

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