

PROGRESSIVE
COMPANIES



PROJECT MANUAL FOR:

**GREENVILLE UTILITIES COMMISSION
RENOVATIONS TO OPERATIONS CENTER
BUILDING 2 AND BUILDING 3**

3355 NC-43

GREENVILLE, NC 27834

PROJECT NO. 21350003

ISSUED FOR: CONSTRUCTION DOCUMENTS

ISSUANCE DATE: JUNE 17, 2026

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**PROJECT MANUAL FOR:
GREENVILLE UTILITIES COMMISSION
RENOVATIONS TO OPERATIONS CENTER BUILDING 2 AND BUILDING 3
3355 NC-43
GREENVILLE, NC 27834**

**PREPARED FOR:
GREENVILLE UTILITIES COMMISSION
3355 NC-43
GREENVILLE, NC 27834**

**PREPARED BY:
LEGAL ENTITY
(PROGRESSIVE ARCHITECTURE ENGINEERING, P.C.)
616/361-2664 (TELEPHONE)**

PROJECT NO: 21350003

JUNE 17, 2026 - ISSUED FOR CONSTRUCTION DOCUMENTS

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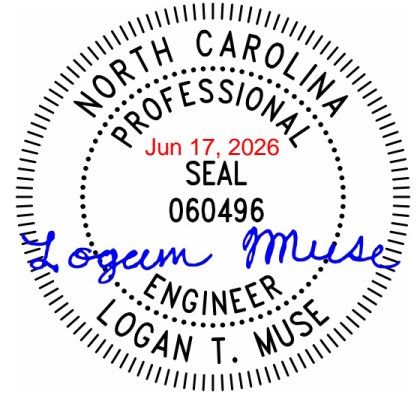
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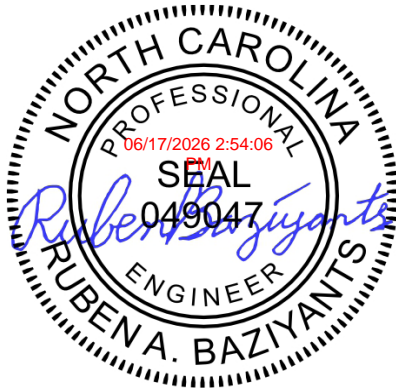
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This item has been electronically signed and sealed by Yi Luo using a Digital Signature and date. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.



This item has been electronically signed and sealed by Logan Thomas Muse using a Digital Signature and date. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.



This item has been electronically signed and sealed by Ruben A. Baziyants using a Digital Signature and date. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.



This item has been electronically signed and sealed by Dane A. Stivers using a Digital Signature and date. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

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ADVERTISEMENT FOR BIDS

Sealed proposals will be received in the Office of the Procurement Manager, Greenville Utilities Commission, 401 S. Greene Street, Greenville, North Carolina 27834 until 2:00 PM (EDT) on Thursday, July 23, 2026, and immediately thereafter publicly opened and read for the Renovations to GUC Operations Center Building 2 and Building 3.

Instructions for submitting bids and complete specifications will be available in the Office of the Procurement Manager, Greenville Utilities Commission, 401 S. Greene Street, Greenville, North Carolina during regular office hours, which are 8:30AM – 5:00PM Monday through Friday.

Greenville Utilities Commission reserves the right to reject any or all bids. **Late bids will not be considered.**

PRE-BID MEETINGS – Two (2) Pre-Bid meetings will be held at Greenville Utilities Commission, Operation Center, 3355 NC-43, Greenville, North Carolina 27834 on Tuesday, June 30, at 2:00 pm (EDT) & Thursday, July 9, 2026, at 2:00pm (EDT). Park in the Visitor's lot and meet in the Lobby of the Engineering & Operations Building #2.

The intent of the Pre-Bid Meeting is to allow the bidders an opportunity to ask questions and make clarifications prior to submitting a bid. Being present for One (1) of the Pre-Bid Meetings is mandatory. Information presented will be the same at both meetings.

A site walkthrough will be performed during both Pre-Bid meetings. Only portions of the bid/contract will be discussed. Lack of discussion or clarification of any portion of the bid/contract does not relieve the Bidder from conforming to the provisions of the same.

Questions regarding this Request for Bid (RFB) should be received by or before 5:00pm, Tuesday, July 14, 2026. All questions shall be directed via e-mail to the attention of Cleve Haddock, Lifetime CLGPO, Procurement Manager at: haddocgc@guc.com, (252) 551-1533.

SECTION I
GENERAL INSTRUCTIONS FOR FORMAL BIDS
RELATED TO THE PURCHASE OF APPARATUS, SUPPLIES,
MATERIALS, AND EQUIPMENT

1.0 NOTICE TO BIDDERS

Sealed bids, subject to the conditions made a part hereof, will be received in the Office of the Procurement Manager, Greenville Utilities Commission, 401 S. Greene Street, Greenville, North Carolina 27834 until 2:00 PM (EDT) on Thursday, July 23, 2026, the day of opening. **Bids submitted in a fax or e-mail in response to this Invitation for Bids will not be acceptable. Late Bids will not be considered.**

2.0 STANDARD FORMS REQUIRED

Each bidder must submit a proposal on the enclosed bid forms. **The bid must be signed by an authorized official of the firm. Return only the attached Proposal Form. Do not return the Advertisement for Bids, Instructions to Bidders or Specifications.**

3.0 PREPARATION OF BID

Bids must be in sealed envelopes clearly marked on the outside with the name of the bid and the bid opening date and time. Bid shall be addressed to the Procurement Manager, GREENVILLE UTILITIES COMMISSION, 401 S. GREENE STREET, GREENVILLE, NORTH CAROLINA 27835-1847.

4.0 TIME FOR OPENING BIDS

Bids will be opened promptly and read at the hour and on the date set forth in the advertisement in the Office of the Procurement Manager, Greenville Utilities Main Office, 401 S. Greene Street, Greenville, North Carolina. Bidders or their authorized agents are invited to be present.

5.0 DEPOSIT

A deposit is required for this bid.

6.0 NC SALES TAX

Do **not** include NC sales taxes in bid figure; however, Greenville Utilities Commission (GUC) does pay sales tax. Sales tax should be added to the invoice as a separate item.

7.0 FEDERAL EXCISE TAX

GUC is exempt from Federal Excise Tax and will issue a Federal Exemption Certificate upon request to the successful bidder.

8.0 EXCEPTIONS TO BE CLEARLY STATED

If bid is not in strict accordance with Section II, "Specifications," bidder must list or note all exceptions **on the Request for Proposal Form**, otherwise, it is fully understood that the successful bidder will furnish equipment and/or materials exactly as specified. GUC reserves the right to accept or reject bids with noted minor deviations from specifications and to determine the lowest responsible, responsive bid from the standpoint of quality, performance, and price.

9.0 EVALUATION AND AWARD OF BIDS

GUC reserves the right to reject any and all bids, to waive any and all informalities, and to disregard all nonconforming or conditional bids or counter proposals. In evaluating bids, GUC shall consider whether the bids comply with the prescribed requirements, plus all alternates or options requested. GUC reserves the right to include or exclude any option or alternative in GUC's opinion is in GUC's best interests. If a bid is to be awarded, it will be awarded to the lowest responsible, responsive bidder whose evaluation by GUC indicates that the award will be in GUC's best interests. Only firm prices will be considered for award of this bid.

10.0 PROMPT PAYMENT DISCOUNTS

Bidders are urged to compute all discounts into the price offered. If a prompt payment discount is offered, it may be considered in the award of the contract.

11.0 NUMERICAL ERRORS

In the case of a discrepancy between a unit price and the extension (the unit price multiplied by the number of units), the unit price governs. In the case where numerical bids are stated both in numbers and in words, the words govern.

12.0 BID WITHDRAWAL

A bidder must notify GUC in writing of its request to withdraw a bid within seventy-two (72) hours after the bid opening, not including Saturdays, Sundays, or holidays. In order to justify withdrawal, the bidder must demonstrate that a substantial error exists and that the bid was submitted in good faith.

13.0 MINORITY BUSINESS PARTICIPATION PROGRAM

GUC has adopted an Affirmative Action and Minority and Women Business Enterprise Plan (M/WBE) Program. Firms submitting a proposal are attesting that they also have taken

affirmative action to ensure equality of opportunity in all aspects of employment, and to utilize M/WBE suppliers of materials and/or labor.

14.0 QUANTITIES

Quantities specified are only estimates of GUC's requirements. GUC reserves the right to purchase more or less than the stated quantities at prices indicated in the submitted Proposal Form based on our actual needs.

15.0 DELIVERY

Shipments will be made to GUC only upon releases from a purchase order issued by GUC in accordance with its current needs.

Time is of the essence with respect to all deliveries under this Agreement.

Delivery of all equipment, materials, or supplies shall be made Free on Board (FOB), GUC Warehouse, 701 Utility Way, Greenville, North Carolina 27834, unless otherwise specified. The agreed price for such equipment, materials, or supplies shall include all costs of delivery and ownership, and risks of loss shall not be transferred from Provider to GUC until express written acceptance of delivery and inspection by GUC. Delivery hours are between 8:00 AM and 4:30 PM Monday-Friday only. **GUC's purchase order number is to be shown on the packing slip or any related documents.** GUC reserves the right to refuse or return any delivery with no purchase order number or which is damaged. GUC will not be charged a restocking fee for any delivery which is refused or returned.

16.0 DELIVERY TIME

Delivery time is to be stated and will be considered in the evaluation of bids. Failure by the successful bidder to meet quoted delivery shall be interpreted as non-compliance with these specifications and may be deemed sufficient cause for removal of the manufacturer and/or distributor from our lists as acceptable manufacturers or bidders.

17.0 CONTRACT PERIOD

TBD.

18.0 MANUFACTURER

Bidder is to specify the manufacturer of RTUs being quoted. If requested, bidder shall identify the place of manufacturer of all RTUs being quoted.

19.0 CONTACT INFORMATION

Questions regarding this bid request should be directed to Cleve Haddock, Procurement Manager, Finance Department at (252) 551-1533, haddocgc@guc.com. **All questions must be received via e-mail by or before 5:00pm (EDT) Tuesday, July 14, 2026.**

20.0 TERMS AND CONDITIONS

The attached Terms and Conditions apply to all purchases made by Greenville Utilities Commission (GUC) and must be considered as part of the bid proposal.

[Balance of page left blank intentionally]

Vendor Name: _____

GREENVILLE UTILITIES COMMISSION

PROPOSAL FORM

QUOTATIONS SHOULD BE RECEIVED BY 2:00 PM ON Thursday, July 23, 2026.

Quotations can be mailed or delivered to Cleve Haddock, Lifetime CLGPO, Procurement Manager, 401 South Greene Street, Greenville, N.C. 27834. Greenville Utilities reserves the right to reject any and all quotes that are not in GUC's best interest.

The Bidder proposes and agrees if this proposal is accepted to contract with Greenville Utilities Commission in the form of contract specified herein to furnish all necessary materials , equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the construction and renovation of the GUC New Operations Center Building 2 and Building 3 as indicated on the contract documents. The project must be complete by early 2027, in full in complete accordance with the plan's specifications and contract documents to full and entire satisfaction of GUC and Progressive Companies.

Item No.	Description	Delivery Time (Days)	\$ Price
I	Base Bid		
II	Alternate # 1 – Provide motorized folding partitions in Building 2 per specifications and electrical drawings. Base Bid includes manual folding partitions.		
III	Alternate # 2 – Includes entire palletized HVAC scope for Building 3.		
IV	Alternate # 3 – Includes entire mezzanine scope. Base Bid includes providing foundation and walls as shown in documents for Building 3 mezzanine only.		

TOTAL \$ _____

The undersigned bidder hereby declares that it has carefully examined the enclosed detailed specifications for furnishing GUC with the below listed items. The undersigned bidder further agrees, if this proposal is accepted within thirty (30) days from the date of the opening, to furnish any or all of the items upon the quoted price.

Method of Award: GUC will award this bid as a total bid.

Complete and Check All Math: It is the responsibility of the Bidder to extend unit prices and supply a total for all items.

It is certified that this proposal is made in good faith and without collusion or connection with any other person bidding on the same above listed items. It is also certified that this proposal is made in good faith and without collusion or connection with any GUC employee(s).

Certified check or cash for \$ _____ or bid bond for \$ _____ attached.

Firm Name _____ Phone (_____) _____

Address _____

City _____ State _____ Zip Code _____

Fax (____) _____ E-Mail _____

Authorized Official _____ Title _____
Typed Name

Signature Date _____

One (1) Sealed Hard copy & One (1) Electronic copy of your proposal should be received no later than Thursday, July 23, 2026 at 2:00 PM (EDT).

NO BIDS CONSIDERED UNLESS SUBMITTED ON THIS FORM(S)

(RETURN ONLY THIS FORM(S) AND EXCEPTION, E-VERIFY)

GREENVILLE UTILITIES COMMISSION

GREENVILLE, NORTH CAROLINA

SPECIFICATION/ EXCEPTION FORM

Specifications for: Renovations to Operation Center Building 2 and Building 3

Bidder's Certification: This is to certify that it is our intent to furnish equipment, material, services, etc. in absolute compliance with the bid specification except where expressly noted below.

Instructions: The following is a list of exceptions to the bidding documents and/or specifications pertaining to the renovation of GUC New Operations Center Building 2 and Building 3. Bidders shall identify each exception by specification page and paragraph number on this form. The omission of exception assumes complete compliance with the Specifications.

<u>Page/Paragraph #</u>	<u>Exception/Variation</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Firm Represented: _____

Typed Name: _____

Authorized Signature of Certification: _____

Date: _____

Letter of Compliance to E-Verify for Greenville Utilities Commission

1. I have submitted a bid for contract or desire to enter into a contract with the Greenville Utilities Commission;
2. As part of my duties and responsibilities pursuant to said bid and/or contract, I affirm that I am aware of and in compliance with the requirements of E-Verify, Article 2 of Chapter 64 of the North Carolina General Statutes, to include (mark which applies):
3. ____ After hiring an employee to work in the United States I verify the work authorization of said employee through E-Verify and retain the record of the verification of work authorization while the employee is employed and for one year thereafter; or
4. ____ I employ less than twenty-five (25) employees in the State of North Carolina.
5. As part of my duties and responsibilities pursuant to said bid and/or contract, I affirm that to the best of my knowledge and subcontractors employed as a part of this bid and/or contract, are in compliance with the requirements of E-Verify, Article 2 of Chapter 64 of the North Carolina General Statutes, to include (mark which applies):
6. ____ After hiring an employee to work in the United States the subcontractor verifies the work authorization of said employee through E-Verify and retains the record of the verification of work authorization while the employee is employed and for one year thereafter; or
7. ____ Employ less than twenty-five (25) employees in the State of North Carolina.
Specify subcontractor: _____

_____ (Company Name)

By: _____ (Typed Name)

_____ (Authorized Signatory)

_____ (Title)

_____ (Date)

Special Instructions to Bidders

**City of Greenville/Greenville Utilities Commission
Minority and/or Women Business Enterprise (M/WBE) Program**

**GUC
Construction Guidelines and Affidavits
\$100,000 and above**

City of Greenville/Greenville Utilities Commission Minority and/or Women Business Enterprise Program

\$100,000 and Construction Guidelines for M/WBE Participants

Policy Statement

It is the policy of the City of Greenville and Greenville Utilities Commission to provide minorities and women equal opportunity for participating in all aspects of the City’s and Utilities’ contracting and procurement programs, including but not limited to, construction projects, supplies and materials purchases, and professional and personal service contracts.

Goals and Good Faith Efforts

Bidders responding to this solicitation shall comply with the M/WBE program by making Good Faith Efforts to achieve the following aspiration goals for participation.

	GUC	
	MBE	WBE
Construction This Goal includes Construction Manager	7%	4%

Bidders shall submit M/WBE information with their bids on the forms provided. This information will be subject to verification by GUC prior to contract award. **As of July 1, 2009, contractors, subcontractors, suppliers, service providers, or M/WBE members of joint ventures intended to satisfy GUC M/WBE goals shall be certified by the NC Office of Historically Underutilized Businesses (NC HUB) only.** Firms qualifying as “WBE” for GUC’s goals must be designated as a “women-owned business” by the HUB Office. Firms qualifying as “MBE” for GUC’s goals must be certified in one of the other categories (i.e.: Black, Hispanic, Asian American, American Indian, Disabled, or Socially and Economically Disadvantaged). Those firms who are certified as both a “WBE” and “MBE” may only satisfy the “MBE” requirement. A complete database of NC HUB certified firms may be found at <http://www.doa.nc.gov/hun/>. An internal database of firms who have expressed interest to do business with the City and GUC is available at www.greenvillencmwbe.org. However, the HUB status of these firms must be verified by the HUB database. GUC shall accept NCDOT certified firms on federally funded projects only. Please note: A contractor may utilize any firm desired. However, for participation purposes, all M/WBE vendors who wish to do business as a minority, or a female must be certified by NC HUB.

The Bidder shall make good faith efforts to encourage participation of M/WBEs prior to submission of bids in order to be considered as a responsive bidder. Bidders are cautioned that even though their submittal indicates they will meet the M/WBE goal, they should document their good faith efforts and be prepared to submit this information, if requested.

The M/WBE's listed by the Contractor on the **Identification of Minority/Women Business Participation** which are determined by the GUC to be certified shall perform the work and supply the materials for which they are listed unless the Contractors receive prior authorization from the GUC to perform the work with other forces or to obtain materials from other sources. If a contractor is proposing to perform all elements of the work with his own forces, he must be prepared to document evidence satisfactory to the owner of similar government contracts where he has self-performed.

The Contractor shall enter into and supply copies of fully executed subcontracts with each M/WBE or supply signed Letter(s) of Intent to the Project Manager after award of contract and prior to Notice to Proceed. Any amendments to subcontracts shall be submitted to the Project Manager prior to execution.

Instructions

The Bidders Shall Provide with the bid the following documentation:

- Identification of Minority/Women Business Participation
(if participation is zero, please mark zero – Blank forms will be considered nonresponsive)
- Affidavit A (if subcontracting)

OR

- Identification of Minority/Women Business Participation
(if participation is zero, please mark zero – Blank forms will be considered nonresponsive)
- Affidavit B (if self-performing; must attest that bidder does not customarily subcontract work on this type of project – includes supplies and materials)

Within 72 hours or 3 business days after notification of being the apparent low bidder who is subcontracting anything must provide the following information:

- Affidavit C (if aspirational goals are met or are exceeded)

OR

- Affidavit D (if aspirational goals are not met)

After award of contract and prior to issuance of notice to proceed:

- Letter(s) of Intent or Executed Contracts

****With each pay request, the prime contractors will submit the Proof of Payment Certification, listing payments made to M/WBE subcontractors.**

*****If a change is needed in M/WBE Participation, submit a Request to Change M/WBE Participation Form. Good Faith Efforts to substitute with another M/WBE contractor must be demonstrated.**

Minimum Compliance Requirements:

All written statements, affidavits, or intentions made by the Bidder shall become a part of the agreement between the Contractor and the GUC for performance of contracts. Failure to comply with any of these statements, affidavits or intentions or with the minority business guidelines shall constitute a breach of the contract. A finding by the GUC that any information submitted (either prior to award of the contract or during the performance of the contract) is inaccurate, false, or incomplete, shall also constitute a breach of the contract. Any such breach may result in termination of the contract in accordance with the termination provisions contained in the contract. It shall be solely at the option of the GUC whether to terminate the contract for breach or not. In determining whether a contractor has made Good Faith Efforts, the GUC will evaluate all efforts made by the Contractor and will determine compliance regarding quantity, intensity, and results of these efforts.

The total value of WBE business contracting will be (\$) _____.
Greenville Utilities Commission AFFIDAVIT A – Listing of Good Faith Efforts

County of _____

Affidavit of _____
(Name of Bidder)

I have made a good faith effort to comply under the following areas checked:

Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30 I.0101)

- 1 – (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
- 2 – (10 pts)** Made the construction plans, specifications and requirements available for review for review by prospective minority businesses or providing these documents to them at least 10 days before the bids are due.
- 3 – (15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- 4 – (10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- 5 – (10 pts)** Attended Prebid meetings scheduled by the public owner.
- 6 – (20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- 7 – (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- 8 – (25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in

obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.

9 – (20 pts) Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.

10 – (20 pts) Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

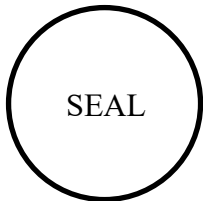
The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the identification of Minority/Women Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d). Failure to abide by this statutory provision will constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of the minority/women business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20_____

Notary Public _____

My Commission expires _____

Greenville Utilities Commission - AFFIDAVIT B - Intent to Perform Contract with Own Workforce

County of _____

Affidavit of _____
(Name of Bidder)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type of project, and normally performs and has the capability to perform and will perform all elements of the work on this project with his/her own current work forces; and

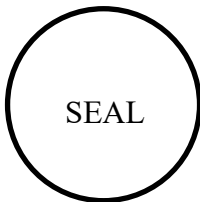
The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title:



State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20_____

Notary Public _____

My commission expires _____

Greenville Utilities Commission – AFFIDAVIT C – Portion of the Work to be Performed by M/WBE Firms

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the portion of the work to be executed by M/WBE businesses as defined in GS143-128.2(g) and the COG/GUC M/WBE Plan sec. III is equal to or greater than 11% of the bidder’s total contract price, then the bidder must complete this affidavit. This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification.

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

(Project Name)

Project ID# _____ Amount of Bid \$ _____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises and a minimum of _____% of the total dollar amount of the contract with women business enterprises. Minority/women businesses will be employed a construction subcontractors, vendors, suppliers, or providers of professional services. Such work will be subcontracted to the following firms listed below.

Name and Phone Number	*M/WBE Category	Work Description	Dollar Value

*M/WBE categories: Black, African American (**B**), Hispanic, Latino (**L**), Asian American (**A**), American Indian (**I**), Female (**F**), Socially and Economically Disadvantaged (**S**), Disabled (**D**)

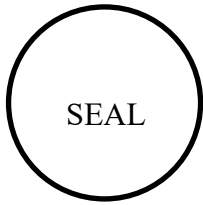
Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with M/WBE Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20_____

Notary Public _____

My commission expires _____

Greenville Utilities Commission – AFFIDAVIT D – Good Faith Efforts

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder)

If the goal of 11% participation by minority/women business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

Affidavit of _____ I do hereby certify that on the _____
(Name of Bidder)

_____ (Project Name)

Project ID# _____ Amount of Bid \$ _____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises and a minimum of _____% of the total dollar amount of the contract with women business enterprises. Minority/women businesses will be employed a construction subcontractors, vendors, suppliers, or providers of professional services. Such work will be subcontracted to the following firms listed below.

Name and Phone Number	*M/WBE Category	Work Description	Dollar Value

*M/WBE categories: Black, African American (**B**), Hispanic, Latino (**L**), Asian American (**A**), American Indian (**I**), Female (**F**), Socially and Economically Disadvantaged (**S**), Disabled (**D**)

Examples of documentation required to demonstrate the Bidder's good faith efforts to meet the goals set forth in these provisions include, but are not necessarily limited to, the following:

- A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.
- B. Copies of quotes or responses received from each firm responding to the solicitation.
- C. A telephone log of follow-up calls to each firm sent a solicitation.

- D. For subcontracts where a minority business firm is not considered the lowest responsible, responsive sub-bidder, copies of quotes received from all firms submitting quotes for that subcontract.
- E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.
- F. Copy of pre-bid roster.
- G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.
- H. Letter detailing reasons for rejection of minority business due to lack of qualification.
- I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder

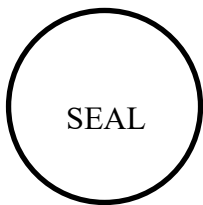
Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with M/WBE Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20_____

Notary Public _____

My commission expires _____

LETTER OF INTENT M/WBE Subcontractor Performance

Please submit this form or executed subcontracts with M/WBE firms after award of contract and prior to issuance of notice to proceed.

PROJECT: _____
 (Project Name)

TO: _____
 (Name of Prime Bidder/Architect)

The undersigned intends to perform work in connection with the above project as a:

_____ Minority Business Enterprise _____ Women Business Enterprise

The M/WBE status of the undersigned is certified by the NC Office of Historically Underutilized Businesses (required). _____ Yes _____ No

The Undersigned is prepared to perform the following described work or provide materials or services in connection with the above project at the following dollar amount:

Work/Materials/Service Provided	Dollar Amount of Contract	Projected Start Date	Projected End Date

 (Date)

 (Address)

 (Name & Phone No. of M/WBE Firm)

 (Name & Title of Authorized Representative of M/WBE)

 (Signature of Authorized Representative of M/WBE)

REQUEST TO CHANGE M/WBE PARTICIPATION

Submit changes only if notified as apparent lowest bidder, continuing through project completion)

Project: _____

Bidder or Prime Contractor: _____

Name & Title of Authorized Representative: _____

Address: _____ **Phone #:** _____

_____ **Email Address:** _____

Total Contract Amount (including approved change orders or amendments): \$ _____

Name of Subcontractor: _____

Good or service provided: _____

Proposed Action:

- _____ Replace subcontractor
- _____ Perform work with own forces

For the above actions, you must provide one of the following reasons (Please check applicable reason):

_____ The listed MBE/WBE, after having had a reasonable opportunity to do so, fails or refuses to execute a written contract.

_____ The listed MBE/WBE is bankrupt or insolvent.

_ The listed MBW/WBE fails or refuses to perform his/her subcontract or furnish the listed materials.

_____ The work performed by the listed subcontractor is unsatisfactory according to industry standards and is not in accordance with the plans and specifications; or the subcontractor is substantially delaying or disrupting the progress of the work.

If replacing subcontractor:

Name of replacement subcontractor: _____

The M/WBE status of the contractor is certified by the NC Office of Historically Underutilized Businesses (required). _____ Yes _____ No

Dollar amount of original contract \$ _____

Dollar amount of amended contract \$ _____

Other Proposed Action:

_____ Increase total dollar amount of work

_____ Add additional subcontractor

_____ Decrease total dollar amount of work

_____ Other

Please describe reason for requested action: _____

If adding additional subcontractor*

The M/WBE status of the contractor is certified by the NC Office of Historically Underutilized Businesses (required). _____ Yes _____ No

Please attach Letter of Intent or executed contract document

Dollar amount of original contract \$

Dollar amount of amended contract \$

Interoffice Use Only:

Approval Y N

Date _____

Signature _____

Proof of Payment Certification
M/WBE Contractors, Suppliers, Service Providers

Project Name: _____

Pay Application No. _____

Prime Contractor: _____

Purchase Order No. _____

Current Contract Amount (including change orders): \$ _____

Requested Payment Amount for this Period: \$ _____

Is this the final payment? ___ Yes ___ No

Firm Name	*M/WBE Category	Total Amount Paid from this Pay Request	Total Contract Amount (including changes)	Total Amount Remaining

*M/WBE categories: Black, African American (**B**), Hispanic, Latino (**L**), Asian American (**A**), American Indian (**I**), Female (**F**), Socially and Economically Disadvantaged (**S**), Disabled (**D**)

Date: _____

Certified By: _____

Name

Title

Signature

BID BOND

KNOW ALL MEN BY THESE PRESENT, THAT WE _____
_____ as Principal, and _____
as Surety, who is duly licensed to act as Surety in North Carolina, are held and firmly bound unto
the Greenville Utilities Commission, Greenville, NC, as Obligee, in the penal sum of

_____ DOLLARS (\$_____) (5% Bid Bond),
lawful money of the United States of America, for the payment of which, well and truly to be
made, we bind ourselves, our heirs, administrators, successors and assigns, jointly and severally,
firmly by these present.

SIGNED, Sealed and dated this _____ day of _____, 2025.

WHEREAS, the said Principal is herewith submitting a Proposal for

RENOVATIONS TO OPERATION CENTER BUILDING 2 AND BUILDING 3

and the Principal desires to file this Bid Bond in Lieu of making the cash deposit as required by
the bidding documents contained herein;

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION is such that if the
principal shall be awarded the Purchase Order for which the bid is submitted and shall accept the
Purchase Order within ten (10) days after the award of same to the principal, then this obligation
shall be null and void; but if the principal fails to so accept such purchase order as required by the
bidding documents contained herein, the Surety shall, upon demand, forthwith pay to the Obligee
the amount set forth in the first paragraph hereof, and upon failure to forthwith make such
payment, the Surety shall pay the Obligee an amount equal to double the amount of this Bid
Bond as set forth in the first paragraph hereof. Power of Attorney from the surety to is
Attorney-in-Fact is attached hereto.

Principal

By _____(SEAL)

Corporate Surety

By _____(SEAL)

PERFORMANCE BOND/PAYMENT BOND

Date of Execution: _____

Name of Principal: _____

(Contractor) _____

Name of Surety: _____

Name of Contracting
Body: _____

Amount of Bond: _____

Project: _____

KNOW ALL THESE MEN BY THESE PRESENT, That We, the Principal and Surety above named, are held and firmly bound unto the above named Contracting Body, hereinafter called the Contracting Body, in the penal sum of the amount stated above the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these present.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal entered into a certain Contract with the Contracting Body, identified as shown above and hereto attached.

NOW, THEREFORE, if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term of said Contract and any extensions there of that may be granted by the Contracting Body, with or without notice to the Surety, and during the life of any guaranty required under the Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modifications to the Surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above bounded parties have executed this instrument under the several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed, and these present duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in five (5) counterparts.

Witness:

CONTRACTOR:

(Proprietorship or Partnership)

(Trade or Corporate Name)

ATTEST:

By:

By: _____

Title: _____
(Corporate Secretary or
Assistant Secretary Only)

Title: _____

(CORPORATE SEAL)

Witness:

SURETY COMPANY:

Countersigned:

By: _____

Title: _____
(Attorney-in-Fact)

N.C. Licensed Resident Agent

(Name and Address – Surety Agent)

(SURETY SEAL)

Surety Company Name and N.C.
Regional or Branch Office Address

SECTION III

**TERMS AND CONDITIONS FOR THE PURCHASE OF
APPARATUS, SUPPLIES, MATERIALS, LABOR AND EQUIPMENT**

These Terms and Conditions, made and entered into on this the ___ day of _____, by and between GREENVILLE UTILITIES COMMISSION OF THE CITY OF GREENVILLE, PITT COUNTY, NORTH CAROLINA, with one of its principal offices and places of business at 401 S. Greene Street, Post Office Box 1847, Greenville, Pitt County, North Carolina 27835-1847, hereinafter referred to as "GUC" and _____, a _____ organized and existing under and by virtue of the laws of the State of _____, with one of its principal offices and places of business at _____, hereinafter referred to as "PROVIDER";

1.0 TAXES

No taxes shall be included in any bid prices. GUC is exempt from Federal Excise Tax. GUC is not exempt from North Carolina state sales and use tax or, if applicable, Pitt County sales and use tax. Such taxes shall be shown as a separate item on the invoice.

2.0 INVOICES

It is understood and agreed that orders will be shipped at the established contract prices and quantities in effect on dates orders are placed. Invoicing at variance with this provision may subject the contract to cancellation. Applicable North Carolina sales tax shall be invoiced as a separate line item. All invoices must bear the GUC purchase order number. Mail all invoices to Greenville Utilities Commission, Finance Department, P. O. Box 1847, Greenville, NC 27835-1847.

3.0 PAYMENT TERMS

Payments for equipment, materials, or supplies will be made after the receipt and acceptance of the equipment, materials, supplies or services and after submission of a proper invoice. GUC's normal payment policy is thirty (30) days. GUC will not be responsible for any goods delivered without a purchase order having been issued. Payment will be made in U. S. currency only.

4.0 QUANTITIES

Quantities specified are only estimates of GUC's requirements. GUC reserves the right to purchase more or less than the stated quantities at prices indicated in the submitted Proposal Form based on our actual needs.

5.0 AFFIRMATIVE ACTION

The Provider will take affirmative action in complying with all Federal and State requirements concerning fair employment and employment of the handicapped, and concerning the treatment of all employees, without discrimination by reason of race, color, religion, sex, national origin, or physical handicap.

6.0 CONDITION AND PACKAGING

Unless otherwise indicated in the bid, it is understood and agreed that any item offered or shipped shall be new and in first class condition, that all containers shall be new and suitable for storage or shipment, and that prices include standard commercial packaging.

7.0 SAMPLES

Samples of items, if required, must be furnished free of expense to GUC, and if not destroyed, will, upon request, be returned at the Provider's expense. Request for the return of samples must be made at the bid opening, otherwise, the samples will become GUC's property. Each individual sample must be labeled with Provider's name.

8.0 SPECIFICATIONS

Any deviation from specifications must be clearly pointed out, otherwise, it will be considered that items offered are in strict compliance with specifications, and the Provider will be held responsible. Deviations must be explained in detail. **The Provider shall not construe this paragraph as inviting deviation or implying that any deviation will be acceptable.**

9.0 INFORMATION AND DESCRIPTIVE LITERATURE

Providers are to furnish all information requested. Further, as may be specified elsewhere, each Provider must submit with its proposal: cuts, sketches, descriptive literature, and/or complete specifications covering the products offered. Reference to literature submitted with a previous bid does not satisfy this provision. Bids which do not comply with these requirements will be subject to rejection.

10.0 AWARD OF CONTRACT

As directed by statute, qualified bids will be evaluated and acceptance made of the lowest responsible, responsive bid most advantageous to GUC as determined upon consideration of such factors as prices offered, the quality of the article(s) offered, the general reputation and performance capabilities of the Provider, substantial conformity with the specifications and other conditions set forth in the bid, the suitability of the article(s) for the intended use, the related services needed, the date(s) of delivery and performance, and such other factors deemed by GUC to be pertinent or peculiar to the purchase in question.

Acceptance of the order includes acceptance of all terms, conditions, prices, delivery instructions, and specifications as shown on this set of Terms and Conditions and in this order or attached to and made a part of this order.

The conditions of this order cannot be modified except by written amendment in the form of "Amended Purchase Order," which has been approved by GUC's Procurement Manager.

In the event of a Provider's failure to deliver or perform as specified, GUC reserves the right to cancel the order or any part thereof, without prejudice to GUC's other rights. The Provider agrees that GUC may return part of or all of any shipment at Provider's expense. GUC may charge the Provider with all reasonable expenses resulting from such failure to deliver or perform.

11.0 MEDIATION/BINDING ARBITRATION

In the event of any dispute between the Parties, the Parties agree to submit any dispute to non-binding mediation before a mutually agreeable Mediator prior to initiating litigation. If the Parties are unable to agree upon a Mediator within thirty (30) days after demand therefore, either Party may petition a Court of competent jurisdiction for the designation of a qualified Mediator for these purposes. Each Party shall bear its own costs and expenses of participating in the mediation (including, without limitation, reasonable attorneys' fees), and each Party shall bear one-half (1/2) of the costs and expenses of the Mediator. Unless otherwise agreed, the Parties will hold the mediation in Greenville, North Carolina. The matters discussed or revealed in the mediation session shall not be disclosed in any subsequent litigation.

In the event the matter is not resolved in mediation, either Party may request arbitration. The parties shall jointly select an Arbitrator, and shall be bound by the decision of the Arbitrator with respect to any dispute between the parties with respect to this Agreement. If the parties are unable to mutually agree upon an Arbitrator, the Parties shall each select an Arbitrator, and the two Arbitrators so selected shall select a third Arbitrator, and the decision of the majority of the Arbitrators shall be conclusive and binding upon the Parties. The Parties at all times agree to equally split the costs of any Arbitrator(s) selected in an effort to resolve the dispute between the Parties. Any party desiring to resolve a dispute under the terms of this Agreement shall notify the other Party in writing, and the Parties shall seek to agree upon a mutually agreed-upon Arbitrator within a period of ten (10) days from the date of such written demand. If the Parties are unable to agree within such ten (10) day period, the Parties shall each select an Arbitrator, and the two (2) Arbitrators so selected shall select a third Arbitrator within fifteen (15) days from the date of the written demand for arbitration, and a decision shall be rendered by the Arbitrator(s) so selected within five (5) days after such Arbitrator(s) is selected.

12.0 GOVERNMENT RESTRICTIONS

In the event any Governmental restrictions may be imposed which would necessitate alteration of the material, quality, workmanship, or performance of the items offered on this bid prior to their delivery, it shall be the responsibility of the successful Provider to notify the GUC Procurement Manager, at once, indicating in its letter the specific regulation which required such alterations. GUC reserves the right to accept any such alterations, including any price adjustments occasioned thereby, or, in the sole discretion of GUC, to cancel the contract.

13.0 INSURANCE

13.1 Coverage – During the term of the contract, the Provider at its sole cost and expense shall provide commercial insurance of such type and with the following coverage and limits:

13.1.1 Workers' Compensation – The Provider shall provide and maintain Workers' Compensation Insurance, as required by the laws of North Carolina, as well as employer's liability coverage with minimum limits of \$1,000,000 each accident, covering all Provider's employees who are engaged in any work under the contract. If any work is sublet, the Provider shall require the subcontractor to provide the same coverage for any of its employees engaged in any work under the contract.

13.1.2 General Liability – Commercial Liability Coverage written on an “occurrence” basis in the minimum amount of \$1,000,000 per occurrence.

13.1.3 Automobile – Automobile Liability Insurance, to include coverage for all owned, hired, and non-owned vehicles used in connection with the contract with a minimum combined single limit of \$1,000,000 per accident.

13.1.4 Cyber –The Vendor shall maintain Cyber Liability Insurance with limits of \$3,000,000 per occurrence, providing protection against liability for: (1) privacy breaches (including liability arising from the loss or disclosure of confidential information no matter how it occurs); (2) system breach; (3) denial or loss of service; (4) introduction, implantation, or spread of malicious software code; and (5) unauthorized access to or use of computer systems. Cyber Liability Insurance shall not include any exclusion or restriction for unencrypted portable devices or other media. Vendor shall provide evidence of continuation or renewal for a period of two (2) years following termination of the Agreement.

13.2 Requirements - Providing and maintaining adequate insurance coverage is a material obligation of the Provider. All such insurance shall meet all laws of the State of North Carolina. Such insurance coverage shall be obtained from companies that are authorized to provide such coverage and that are authorized to do business in North Carolina by the Commissioner of Insurance. The Provider shall at all times comply with the terms of such insurance policies and all requirements of the insurer under any of such insurance policies, except as they may conflict with existing North Carolina laws or this contract. The limits of coverage under each insurance policy maintained by the Provider shall not be interpreted as limiting the Provider’s liability and obligations under the contract. It is agreed that the coverage as stated shall not be canceled or changed until thirty (30) days after written notice of such termination or alteration has been sent by registered mail to GUC’s Procurement Manager.

14.0 PATENTS AND COPYRIGHTS

The Provider shall hold and save GUC, its officers, agents, and employees, harmless from liability of any kind, including costs and expenses, including reasonable attorney fees, on account of any copyrighted articles or any patented or unpatented invention, device or appliance manufactured or used in the performance of this contract.

15.0 PATENT AND COPYRIGHT INDEMNITY

The Provider will defend or settle, at its own expense, any action brought against GUC to the extent that it is based on a claim that the product(s) provided pursuant to this agreement infringe any U.S. copyright or patent; and will pay those costs, damages, and attorney fees finally awarded against GUC in any such action attributable to any such claim, but such defense, settlements, and payments are conditioned on the following: (1) that Provider shall be notified promptly in writing by GUC of any such claim; (2) that Provider shall have sole control of the defense of any action on such claim and of all negotiations for its settlement or compromise; (3) that GUC shall cooperate with Provider in a reasonable way to facilitate the settlement of defense of such claim; (4) that such claim does not arise from GUC modifications not authorized by the Provider or from the use of combination of products provided by the Provider with products provided by GUC or by others; and (5) should such product(s) become, or in the

Provider's opinion likely to become, the subject of such claim of infringement, then GUC shall permit Provider, at Provider's option and expense, either to procure for GUC the right to continue using the product(s), or replace or modify the same so that it becomes non-infringing and performs in a substantially similar manner to the original product.

16.0 EXCEPTIONS

All proposals are subject to the terms and conditions outlined herein. All responses will be controlled by such terms and conditions and the submission of other terms and conditions, price catalogs, and other documents as part of a Provider's response will be waived and have no effect on this Request for Proposal or any other contract that may be awarded resulting from this solicitation. The submission of any other terms and conditions by a Provider may be grounds for rejection of the Provider's proposal. The Provider specifically agrees to the terms and conditions set forth in this set of Terms and Conditions by affixing its name on the signatory page contained herein.

17.0 CONFIDENTIAL INFORMATION

Except as provided by statute and rule of law, GUC will keep trade secrets which the Provider does not wish disclosed confidential. Each page shall be identified in boldface at the top and bottom as "CONFIDENTIAL" by the Provider. Cost information shall not be deemed confidential. The determination of whether a matter is confidential will be determined by North Carolina law.

18.0 ASSIGNMENT

No assignment of the Provider's obligations or the Provider's right to receive payment hereunder shall be permitted without the express written consent of GUC, provided however, upon written request approved by the GUC Procurement Manager, solely as a convenience to the Provider, GUC may:

- Forward the Provider's payment check directly to any person or entity designated by the Provider, and
- Include any person or entity designated by Provider as a joint payee on the Provider's payment check.
- In no event shall such approval and action obligate GUC to anyone other than the Provider, and the Provider shall remain responsible for fulfillment of all contract obligations.

19.0 ACCESS TO PERSON AND RECORDS

GUC shall have reasonable access to persons and records of Provider as a result of all contracts entered into by GUC.

20.0 INSPECTION AT BIDDER'S SITE

GUC reserves the right to inspect, at a reasonable time, the item, plant, or other facilities of a prospective Provider prior to contract award and during the contract term as necessary for GUC's determination that such item, plant, or other facilities conform with the

specifications/requirements and are adequate and suitable for the proper and effective performance of the contract. Provider may limit GUC's access to restricted areas.

21.0 AVAILABILITY OF FUNDS

Any and all payments of compensation of this specific transaction and any continuation or any renewal or extension are dependent upon and subject to the allocation of GUC funds for the purpose set forth in this Agreement.

22.0 GOVERNING LAWS

All contracts, transactions, agreements, etc., are made under and shall be governed by and construed in accordance with the laws of the State of North Carolina.

23.0 ADMINISTRATIVE CODE

Bids, proposals, and awards are subject to applicable provisions of the North Carolina Administrative Code and General Statutes and Laws of the State of North Carolina.

24.0 EXECUTION

In the discretion of GUC, failure of a duly authorized official of Provider to sign the Signatory Page may render the bid invalid.

25.0 CLARIFICATIONS/INTERPRETATIONS

Any and all questions regarding these Terms and Conditions must be addressed to the GUC Procurement Manager. Do not contact the user directly. **These Terms and Conditions are a complete statement of the parties' agreement and may only be modified in writing signed by Provider and the GUC Procurement Manager.**

26.0 SITUS

The place of all contracts, transactions, agreements, their situs and forum, shall be North Carolina, where all matters, whether in contract or tort, relating to the validity, construction, interpretation, and enforcement shall be determined.

27.0 TERMINATION OF AGREEMENT

GUC or Provider may terminate this Agreement for just cause at any time. Provider will be paid for all time and expenses incurred as of the termination date. Termination for just cause by either party shall be by certified letter and shall be effective thirty (30) days after signed and acknowledged receipt of said letter. Just cause shall be based on reasonable grounds, and there must be a fair and honest cause or reason for such action. The causes for termination, include, but are not limited to: (1) Provider's persistent failure to perform in accordance with the Terms and Conditions, (2) Provider's disregard of laws and regulations related to this transaction, and/or (3) Provider's substantial violation of the provisions of the Terms and Conditions.

28.0 DELIVERY

Shipments will be made only upon releases from a purchase order issued by GUC in accordance with GUC's current needs.

Time is of the essence with respect to all deliveries under this Agreement.

Delivery of all equipment, materials, or supplies shall be made Free on Board (FOB) GUC Warehouse, 701 Utility Way, Greenville, North Carolina 27834, unless otherwise specified. The agreed price for such equipment, materials, or supplies shall include all costs of delivery and ownership, and risks of loss shall not be transferred from Provider to GUC until express written acceptance of delivery and inspection by GUC. Delivery hours are between 8:00 AM and 4:30 PM Monday-Friday only. **GUC's purchase order number is to be shown on the packing slip or any related documents.** GUC reserves the right to refuse or return any delivery with no purchase order number or which is damaged. GUC will not be charged a restocking fee for any delivery which is refused or returned.

29.0 INDEMNITY PROVISION

Provider agrees to indemnify and save GREENVILLE UTILITIES COMMISSION of the City of Greenville, Pitt County, North Carolina, and the City of Greenville, North Carolina, its co-owners, joint venturers, agents, employees, and insurance carriers harmless from any and all losses, claims, actions, costs, expenses including reasonable attorney fees, judgments, subrogations, or other damages resulting from injury to any person (including injury resulting in death), or damage (including loss or destruction) to property of whatsoever nature of any person arising out of or incident to the performance of the terms of this Contract by Provider, including, but not limited to, Provider's employees, agents, subcontractors, and others designated by Provider to perform work or services in, about, or attendant to, the work and services under the terms of this Contract. Provider shall not be held responsible for any losses, expenses, claims, subrogations, actions, costs, judgments, or other damages, directly, solely, and proximately caused by the negligence of Greenville Utilities Commission of the City of Greenville, Pitt County, North Carolina. Insurance covering this indemnity agreement by the Provider in favor of Greenville Utilities Commission of the City of Greenville, Pitt County, North Carolina, and the City of Greenville, North Carolina, shall be provided by Provider.

30.0 FORCE MAJEURE

Neither party shall be considered in default in the performance of its obligations hereunder to the extent that the performance of any such obligation is prevented or delayed by any cause, existing or future, which is beyond the reasonable control of such party. In any such event of force majeure, the parties shall advise each other of such event, and the parties shall negotiate an equitable adjustment to their respective obligations under this Agreement.

31.0 WARRANTY(IES)

The Provider hereby includes all warranties, whether expressed or implied, including, but not limited to, the Implied Warranty of Merchantability and the Implied Warranty of Fitness for a Particular Purpose.

32.0 INTEGRATED CONTRACT

These Terms and Conditions, Instructions to Bidders, Specifications, and the selected Provider's bid represents the entire contract between the Parties. No verbal or other written agreement(s) shall be held to vary the provisions of this Agreement.

33.0 CONTRACT PROVISIONS

Each of the provisions of these Terms and Conditions shall apply to the full extent permitted by law, and the invalidity in whole or in part of any provision shall not affect the remainder of such provision or any other provisions.

34.0 E-VERIFY

E-Verify - I understand that E-Verify is the federal E-Verify program operated by the United States Department of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work authorization of newly hired employees pursuant to federal law in accordance with NCGS §64-25 et seq. I am aware of and in compliance with the requirements of E-Verify and Article 2 of Chapter 64 of the North Carolina General Statutes. To the best of my knowledge, any subcontractors employed by me as a part of this contract are in compliance with the requirements of E-Verify and Article 2 of Chapter 64 of the North Carolina General Statutes.

35.0 IRAN DIVESTMENT ACT CERTIFICATION

By acceptance of this purchase order, Vendor/Contractor certifies that, as of the date of the purchase order or contract, it is not on the Final Divestment List as created by the State Treasurer pursuant to N.C.G.S. § 143-6A-4. In compliance with the requirements of the Iran Divestment Act and N.C.G.S. § 143C-6A-5(b), Vendor/Contractor shall not utilize in the performance of the contract any subcontractor that is identified on the Final Divestment List.

36.0 UNIFORM GUIDANCE

Contracts funded with federal grant or loan funds must be procured in a manner that conforms with all applicable federal laws, policies, and standards, including those under the Uniform Guidance (2 C.F.R. Part 200).

37.0 SAFETY STATEMENTS

Safety Culture Commitment Statement:

At Greenville Utilities, we are committed to a culture of safety that prioritizes the well-being of our employees, contractors, and the communities we serve.

We believe that everyone deserves to work in a safe environment, and we are dedicated to fostering a culture where **safety is a core value, not just a priority.**

Here's what that means to us:

- **Employee and Contractor Safety:** We are committed to providing a safe work environment for all employees and contractors. We will invest in safety training, resources, and equipment to prevent accidents and injuries.
- **Open Communication:** We encourage open and honest communication about safety concerns. We believe everyone has a right and responsibility to speak up about unsafe work practices and potential hazards.

- **Continuous Improvement:** We are committed to continuous improvement in safety performance. We will learn from incidents and near misses, and we will actively seek ways to improve our safety processes and procedures.
- **Accountability:** We hold ourselves and our contractors accountable for safe work practices. This includes providing clear safety expectations, enforcing safety rules, and recognizing safe behavior.
- **Collaboration:** We believe in working collaboratively with employees, contractors, and regulatory agencies to achieve the highest level of safety.

Our commitment to safety extends beyond our employees. We work closely with our contractors to ensure they share our safety values. We expect them to implement robust safety programs, train their workers thoroughly, and adhere to all safety regulations.

We are confident that by working together, we can create a culture of safety where everyone goes home safe and healthy every day.

This commitment statement is a public declaration of our unwavering dedication to safety. We will continue to strive for zero incidents while promoting a positive safety culture that prioritizes the well-being of everyone involved in our utility operations.

Safety Management System Commitment Statement:

At Greenville Utilities, we are unwavering in our commitment to delivering safe and reliable utility service through a robust Safety Management System (SMS). This system forms the foundation of our safety culture, ensuring the well-being of our employees, contractors, and the communities we serve.

Our SMS commitment emphasizes:

- **Zero Incidents:** We believe all incidents are preventable. We strive for zero incidents by proactively managing risks and continuously improving our safety practices.
- **Empowered Workforce:** We foster a culture where safety is everyone's responsibility. This includes providing comprehensive safety training for both employees and contractors, empowering them to identify and report hazards.
- **Data-Driven Decisions:** We utilize data from inspections, incident investigations, and performance metrics to make informed decisions for risk mitigation and continuous improvement of our SMS.
- **Leadership Engagement:** Our leadership team actively demonstrates a commitment to safety by participating in safety reviews, audits, and promoting safety as a core value.
- **Contractor Collaboration:** We extend our safety commitment to our contractors. We require contractors working on our system to adhere to SMS principles, participate in safety briefings, and maintain strong safety programs within their own organizations.
- **Transparent Communication:** We believe in open communication about safety. We encourage employees and contractors to report concerns without fear of reprisal. We also maintain transparent communication with stakeholders about SMS performance.

This SMS commitment is a continuous journey, not a destination. We are dedicated to regularly reviewing and updating our system to reflect best practices and emerging technologies. Through continuous improvement and a commitment to a positive safety culture, we aim to remain an industry leader in safe and reliable utility service.

38.0 INFORMATION TECHNOLOGY

All Contracts are subject to Greenville Utilities Commission Information Technology Contract Provisions. These may be viewed at www.guc.com/doing-business-us.

39.0 NOTICES

Notices to the Parties should be sent to the names and addresses specified below:

Cleve Haddock, Lifetime CLGPO
Procurement Manager
Greenville Utilities Commission
P.O. Box 1847
Greenville, NC 27835-1847

Vendor Specified on Page 1 of Section III when awarded.

GREENVILLE UTILITIES COMMISSION

By: _____
Anthony C. Cannon

Title: General Manager/CEO
(Authorized Signatory)

Date: _____

Attest: _____

Name (Print): Amy Wade

Title: Executive Secretary

Date: _____

(OFFICIAL SEAL)

COMPANY NAME:

By: _____

Name (Print): _____

Title: _____
(Authorized Signatory)

Date: _____

Attest: _____

Name (Print): _____

Title: Corporate Secretary

Date: _____

(CORP. SEAL)

APPROVED AS TO FORM AND LEGAL CONTENT:

By: _____
Phillip R. Dixon

Title: General Counsel

Date: _____

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SECTION 00 4323 ALTERNATES FORM

PARTICULARS

1.01 THE FOLLOWING IS THE LIST OF ALTERNATES REFERENCED IN THE BID SUBMITTED BY:

1.02 (BIDDER) _____

1.03 TO (OWNER): GREENVILLE UTILITIES COMMISSION

1.04 DATED _____ AND WHICH IS AN INTEGRAL PART OF THE BID FORM.

ALTERNATES LIST

2.01 THE FOLLOWING AMOUNTS SHALL BE ADDED TO OR DEDUCTED FROM THE BID AMOUNT. REFER TO SECTION 01 2300 - ALTERNATES.

ALTERNATE # 1: PROVIDE MOTORIZED FOLDING PARTITIONS IN BUILDING 2

ADD / (DEDUCT) \$ _____

ALTERNATE # 2: INCLUDES ENTIRE PALLETIZED HVAC SCOPE FOR BUILDING 3

ADD / (DEDUCT) \$ _____

ALTERNATE # 3: INCLUDES ENTIRE MEZZANINE SCOPE FOR BUILDING 3

ADD / (DEDUCT) \$ _____

END OF SECTION

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SECTION 00 4325 SUBSTITUTION REQUEST FORM - DURING PROCUREMENT

**PROJECT: GREENVILLE UTILITIES COMMISSION RENOVATIONS TO OPERATIONS
CENTER BUILDING 2 AND BUILDING 3
PROJECT NO. : 21350003**

To: Progressive Companies; Attention: Amber Idol; *aidol@weareprogressive.com*

Re: _____

From: _____ Date: _____

DESCRIPTION:

Specification Title: _____

Section No.: _____ Page: _____

Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____

Trade Name: _____

Model No.: _____

Web Site: _____

SUPPORTING DATA ATTACHED:

- Attached data to include product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are to be clearly identified.

- Attached data to also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

() Drawings () Product Data () Samples () Tests () Reports () _____

THE UNDERSIGNED CERTIFIES:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.

- Same warranty will be furnished for proposed substitution as for specified product.

- Same maintenance service and source of replacement parts, as applicable, is available.

- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.

- Proposed substitution does not affect dimensions and functional clearances.

- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Signed by: (printed) _____

(signature) _____

Address: _____

Email: _____

A/E'S REVIEW AND ACTION:

() Substitution approved - Make submittals in accordance with Specification Section 01 6000 - Product Requirements, Substitution Procedures.

() Substitution approved as noted - Make submittals in accordance with Specification Section 01 6000, Substitution Procedures.

() Substitution rejected - Use specified materials.

() Substitution request received too late - Use specified materials.

Remarks: _____

Signed by: _____ Date: _____

END OF SECTION

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SECTION 00 6313 REQUEST FOR INTERPRETATION FORM

**PROJECT: GREENVILLE UTILITIES COMMISSION RENOVATIONS TO OPERATION
CENTER BUILDING 2 AND BUILDING 3
PROJECT NO: 21350003**

To Progressive Companies: Attention; Amber Idol email: aidol@weareprogressive.com

Progressive Companies

409 Evans St, Ste, C
Greenville, NC 27858

616-361-2664 VOICE
616-361-1493 FAX

From: Contractor: _____ RFI No: _____

Phone No: _____

Fax No: _____

Date: _____

Submitted By: _____

Name/Trades Contractor: _____

Question Is: Civil ___ Architectural ___ Interiors ___ Structural ___ Mechanical ___
Electrical ___ Communications ___ Other (specify) _____

Re: Project Manual/Drawing/Detail No: _____

Question: _____

Contractor Recommendation and advise of any cost/schedule impacts.: _____

Signed (Contractor Project Manager): _____

Progressive Companies Reply:

Signed (AE): _____ Date _____

Distribution:

Owner: _____

Progressive Companies: _____

Contractor: _____

END OF SECTION

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SECTION 00 6325 SUBSTITUTION REQUEST FORM - DURING CONSTRUCTION

**PROJECT: GREENVILLE UTILITIES COMMISSION RENOVATIONS TO OPERATION CENTER
BUILDING 2 AND BUILDING 3
PROJECT NO. : 21350003**

To: Progressive Companies; Attention: Amber Idol; *aidol@weareprogressive.com*

Re: _____

From: _____ Date: _____

DESCRIPTION:

Specification Title: _____

Section No.: _____ Page: _____

Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____

Trade Name: _____

Model No.: _____

Web Site: _____

Installer: _____

Address: _____

Telephone: _____

History: () New Product () 1-4 years old () 5-10 years old () More than 10 years old

Differences between proposed substitution and specified product:

() Point-by-point comparative data - REQUIRED BY A/E

Reason for not providing specified item:

Similar Installation

Project: _____ Architect: _____

Address: _____ Owner: _____

Date Installed: _____

Proposed Substitution affects other parts of the work: () No () Yes Explain: _____

Savings to Owner for accepting substitution: _____ (\$ _____)

Proposed substitution changes contract time: () No () Yes [add] [deduct] _____ days

SUPPORTING DATA ATTACHED:

- Attached data to include product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are to be clearly identified.

- Attached data to also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

() Drawings () Product Data () Samples () Tests () Reports () _____

SECTION 00 6325 SUBSTITUTION REQUEST FORM - DURING CONSTRUCTION

THE UNDERSIGNED CERTIFIES:

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

Submitted by (Firm): _____

Signed by: (printed) _____

(signature) _____

Address: _____

Email: _____

Attachments: ()

A/E'S REVIEW AND RECOMMENDATION:

- () Substitution approved - Make submittals in accordance with Section 01 3000 - Submittal Procedures for final review.
- () Substitution approved as noted - Make submittals in accordance with Section 01 3000 - Submittal Procedures for final review.
- () Substitution rejected - Use specified materials.

Remarks: _____

Signed by: _____ Date: _____

OWNERS REVIEW AND ACTION:

- () Substitution approved - Make submittals in accordance with Section 01 3000 - Submittal Procedures. Prepare Change Order.
- () Substitution approved as noted - Make submittals in accordance with Section 01 3000 - Submittal Procedures. Prepare Change Order.
- () Substitution rejected - Use specified materials.

Remarks: _____

Signed by: _____ Date: _____

ADDITIONAL COMMENTS:

() Contractor () Subcontractor () Supplier () Manufacturer () A/E

END OF SECTION

SECTION 01 1000 SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Greenville Utilities Commission Renovations to Operation Center Building 2 and Building 3.
- B. Owner's Name: Greenville Utilities Commission.
- C. Architect's Name: Progressive Companies.
- D. The Project consists of the Renovation of Operation Center Buildings 2 and 3.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 5200 - Agreement Form.

1.03 DESCRIPTION OF ALTERATIONS WORK

- A. Scope of alterations work is indicated on drawings.

1.04 WORK BY OWNER

- A. Items noted NIC (Not in Contract) will be supplied and installed by Owner as noted on the contract documents.

1.05 OWNER OCCUPANCY

- A. Owner intends to occupy a certain portion of the Project prior to the completion date for the conduct of normal operations.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy. Work shall be phased with Building #2 work being completed and occupied prior to work at Building #3 beginning. Phase 1 shall include all scope within the Engineering & Operations Building #2 and shall commence directly following the Notice To Proceed and shall be completed within One-Hundred Twenty (120) Days. Procurement for Building #3 shall take place during the initial work phase. Phase #2 shall include all scope within the Systems Support Building #3 and shall commence directly following the acceptance of Phase #1 and shall be completed within Ninety (90) Days.

1.06 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
 - 1. Locate and conduct construction activities in ways that will limit disturbance to site.
- B. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
- C. Utility Outages and Shutdown:
 - 1. Limit disruption of utility services to hours the building is unoccupied.
 - 2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
 - 3. Prevent accidental disruption of utility services to other facilities.

1.07 WORK SEQUENCE

- A. Construct Work in stages during the construction period:
 - 1. Phase 1: Engineering & Operations Building #2 Scope.
 - 2. Phase 2: Systems Support Building #3 Scope.
- B. Coordinate construction schedule and operations with Owner.
- C. Coordinate construction schedule and operations with Architect.

END OF SECTION

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SECTION 01 2000 PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Correlation of Contractor submittals based on changes.
- E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

1.03 SCHEDULE OF VALUES

- A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.
- F. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
- G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.
 - 10. Retainage.
- F. Execute certification by signature of authorized officer.
- G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- I. Submit one electronic and 0 hard-copies of each Application for Payment.
- J. Include the following with the application:
 - 1. Transmittal letter as specified for submittals in Section 01 3000.
 - 2. Partial release of liens from major subcontractors and vendors.
 - 3. Affidavits attesting to off-site stored products.

SECTION 01 2000 PRICE AND PAYMENT PROCEDURES

1.05 MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
- B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 - 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 - 2. Promptly execute the change.
- C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 7 days.
- D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
 - 1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
 - 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
 - 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
 - 4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.
- E. Substantiation of Costs: Provide full information required for evaluation.
 - 1. On request, provide the following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit.
 - d. Justification for any change in Contract Time.
 - e. Credit for deletions from Contract, similarly documented.
 - 2. Support each claim for additional costs with additional information:
 - a. Origin and date of claim.
 - b. Dates and times work was performed, and by whom.
 - c. Time records and wage rates paid.
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
 - 3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- F. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- G. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- H. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- I. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 - 1. All closeout procedures specified in Section 01 7000.
 - 2. Requirements of owner - contractor agreement.

SECTION 01 2000 PRICE AND PAYMENT PROCEDURES

PART 2 PRODUCTS - NOT USED
PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01 2300 ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Description of Alternates.
- B. Procedures for pricing Alternates.
- C. Documentation of changes to Contract Price and Contract Time.

1.02 RELATED REQUIREMENTS

- A. Document 00 4323 - Alternates Form: List of Alternates as supplement to Bid Form.

1.03 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SCHEDULE OF ALTERNATES

- A. Alternate No. 1 - Provide motorized folding partitions in building 2 per specifications and electrical drawings. :
- B. Alternate No. 2 - Includes entire palletized HVAC scope for Building 3.:
- C. Alternate No. 3 - Includes entire mezzanine scope. :

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01 2500 SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Section 00 4325 - Substitution Request Form - During Procurement: Required form for substitution requests made prior to award of contract (During procurement).
- B. Section 00 6325 - Substitution Request Form - During Construction: Required form for substitution requests made after award of contract (During construction).

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.
- D. Limit each request to a single proposed substitution item.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Submittal Time Restrictions:
 - 1. Owner will consider requests for substitutions only if submitted at least 10 days prior to the date for receipt of bids.
- B. Submittal Form (before award of contract):
 - 1. Submit substitution requests by completing the form in Section 00 4325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Submittal Form (after award of contract):
 - 1. Submit substitution requests by completing the form in Section 00 6325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- C. Substitutions will not be considered under one or more of the following circumstances:
 - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - 2. Without a separate written request.
 - 3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.

SECTION 01 2500 SUBSTITUTION PROCEDURES

3.05 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

END OF SECTION

SECTION 01 2600 CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Administrative and procedural requirements for handling and processing Contract modifications.

1.02 RELATED REQUIREMENTS:

- A. Section 01 2500 - Substitution Procedures: Administrative procedures for handling requests for substitutions made after the Contract award.

1.03 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, using AIA Document G710 - Architects Supplemental Instructions.

1.04 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Request: 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. Proposed Modifications are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request submit a quotation, estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. 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.
- B. Contractor-Initiated Proposed Modifications: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a Proposed Change Order.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the Proposed Change Order on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision by superintendent or foreman directly attributable to the change.
 - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - 6. Comply with requirements in Section 01 2500 - Substitution Procedures if the proposed change requires substitution of one product or system for product or system specified.

1.05 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Section 01 2100 - Allowances for administrative procedures for preparation of Change Order for adjusting the Contract Sum to reflect actual costs of allowances.
- B. Unit-Price Adjustment: See Section 01 2200 - Unit Prices for administrative procedures for preparation of Change Order for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.06 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor, using AIA Document G701 - Change Order.

1.07 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive (CCD): Architect may issue a CCD, using AIA Document G714 - Construction Change Directive. CCD instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

SECTION 01 2600 CONTRACT MODIFICATION PROCEDURES

1. CCD contains a complete description of change in the Work and designates method to be followed to determine change in the Contract Sum or Contract Time.
 - a. CCD is a directive for changes in the Work for use where the owner and contractor have not agreed on proposed changes in the Contract Sum or Contract Time. CCD is used to direct changes in the Work which, if not expeditiously implemented, might delay the project. Upon receipt of a completed CCD, the contractor must promptly proceed with the change in the work described therein.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 3000 ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Submittals for review, information, and project closeout.
- F. Number of copies of submittals.
- G. Requests for Interpretation (RFI) procedures.
- H. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 01 6000 - Product Requirements: General product requirements.
- B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
- C. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Architect:
 - 1. Requests for Interpretation (RFI).
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.

1.04 PROJECT COORDINATOR

- A. : Architect.
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for building access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 1000 - Summary.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- G. Make the following types of submittals to Architect through the Project Coordinator:
 - 1. Requests for Interpretation.
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.

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8. Progress schedules.
9. Coordination drawings.
10. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

- A. Schedule meeting after Notice of Award.
- B. Attendance Required:
 1. Owner.
 2. Architect.
 3. Contractor.
- C. Agenda:
 1. Execution of Owner-Contractor Agreement.
 2. Submission of executed bonds and insurance certificates.
 3. Distribution of Contract Documents.
 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 5. Designation of personnel representing the parties to Contract, Owner and Architect.
 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 7. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

- A. Architect will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- B. Attendance Required:
 1. Contractor.
 2. Owner.
 3. Architect.
 4. Contractor's superintendent.
 5. Major subcontractors.
- C. Agenda:
 1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review of RFIs log and status of responses.
 7. Maintenance of progress schedule.
 8. Corrective measures to regain projected schedules.
 9. Planned progress during succeeding work period.
 10. Coordination of projected progress.
 11. Maintenance of quality and work standards.
 12. Effect of proposed changes on progress schedule and coordination.
 13. Other business relating to work.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

- A. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

3.04 REQUESTS FOR INTERPRETATION (RFI)

- A. Definition: A request seeking one of the following:

SECTION 01 3000 ADMINISTRATIVE REQUIREMENTS

1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
- C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
 1. Prepare a separate RFI for each specific item.
 - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
 - b. Do not forward requests which solely require internal coordination between subcontractors.
 2. Prepare in a format and with content acceptable to Owner.
- D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
 1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
 2. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
 - a. Approval of submittals (use procedures specified elsewhere in this section).
 - b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
 - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
 - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
 3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
 4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
 - a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.
- E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
 1. Official Project name and number, and any additional required identifiers established in Contract Documents.
 2. Submit form found in Section 00 6313 - Request for Interpretation, providing all information requested.
- F. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
 1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
- G. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
 1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.

SECTION 01 3000 ADMINISTRATIVE REQUIREMENTS

2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
3. Notify Architect within two calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.05 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.06 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 1. Design data.
 2. Certificates.
 3. Test reports.
 4. Inspection reports.
 5. Manufacturer's instructions.
 6. Manufacturer's field reports.
 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
 1. Project record documents.
 2. Operation and maintenance data.
 3. Warranties.
 4. Bonds.
 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.08 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 1. After review, produce duplicates.
 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.09 SUBMITTAL PROCEDURES

- A. General Requirements:
 1. Use a separate transmittal for each item.
 2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
 3. Transmit using approved form.
 - a. Use Contractor's form, subject to prior approval by Architect.
 4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.

SECTION 01 3000 ADMINISTRATIVE REQUIREMENTS

5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 7. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 14 days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
 8. Provide space for Contractor and Architect review stamps.
 9. When revised for resubmission, identify all changes made since previous submission.
 10. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
 11. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
 12. Submittals not requested will be recognized, and will be returned "Not Reviewed",
- B. Product Data Procedures:
1. Submit only information required by individual specification sections.
 2. Collect required information into a single submittal.
 3. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 2. Do not reproduce Contract Documents to create shop drawings.
 3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
1. Transmit related items together as single package.
 2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
 3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.

3.10 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
- D. Architects Action: General: Except for submittals for the record and similar purposes, where action and return on submittals are required or requested, the Architect will review each submittal and mark with appropriate "action" within 10 working days. Where the submittal must be held for coordination, the Architect will so advise the Contractor without delay. The Architects review of a specific item shall not indicate review of an assembly of which the item is a component.
 1. Architects action stamp: The Architect will stamp each submittal to be returned with a uniform, self explanatory action stamp, appropriately marked and executed. It shall read as follows:

SECTION 01 3000 ADMINISTRATIVE REQUIREMENTS

- a. "This submittal is reviewed for general conformance with the design concept of the project and with information given in the Contract Documents. This review shall not constitute approval of safety precautions and is not conducted for substantiating instructions for installation or performance of equipment or systems. This review does not relieve the contractor of responsibility for conformance with the Contract Documents and applicable codes, all of which have priority over this submittal. The Architect/Engineer does not warrant or represent that the information within the submittal is either accurate or complete. The contractor is responsible for coordinating and verifying all quantities, dimensions, tolerances, clearances, fabrication processes, techniques, sequences, means, methods of construction and compatibility of materials. It is also understood that the contractor has reviewed and coordinated all related trades and components of an assembly prior to issuing a submittal for review."
 - b. Marking X No Exceptions Taken
 - 1) Final unrestricted release. Where the submittals are marked as above, the work covered by the submittal may proceed, provided it complies with the requirements of the contract documents; acceptance of the work will depend upon that compliance.
 - c. Marking X Make Corrections Noted
 - 1) Final but restricted release. When submittals are marked as above, work covered by submittal may proceed, provided it complies with both Architect's notations or corrections on the submittal and with the requirements of the contract documents; acceptance of the work will depend on that compliance.
 - d. Marking X Revise and Resubmit
 - 1) Returned for resubmittal. When submittal is marked as above, revise or prepare new submittal in accordance with Architect's notations stating reasons for returning submittal; cloud all revisions to expedite review; resubmit submittal without delay. Repeat if necessary to obtain a different action marking. Do not permit submittals with the above marking to be used at the project site or elsewhere where work is in progress.
 - e. Marking X Rejected
 - 1) Returned for resubmittal. When the submittal is marked as above, do not proceed with the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise the submittal, or prepare a new submittal in accordance with the Architect's notations stating the reasons for returning the submittal. Resubmit the submittal without delay. Repeat if necessary to obtain a different action marking. Do not permit submittals with the above marking to be used at the project site or elsewhere where work is in progress."
 - f. Marking X For Record Purposes Only
 - 1) No Action Taken/Required or Not Required for Review. When a submittal is marked as above, the A/E has retained submittal for their record keeping purposes or to track informational submittals that do not require review or approval. These submittals are processed only as a record of the construction.
- E. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "Approved", or language with same legal meaning.
 - b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
 2. Not Authorizing fabrication, delivery, and installation:
- F. Architect's and consultants' actions on items submitted for information:
1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
 2. Items for which action was taken:

SECTION 01 3000 ADMINISTRATIVE REQUIREMENTS

- a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

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SECTION 01 4000 QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Control of installation.
- F. Mock-ups.
- G. Tolerances.
- H. Manufacturers' field services.
- I. Defect Assessment.

1.02 REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).
- B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2026.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2025.
- D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.
- E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2025b.
- F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2015.
- G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.
- H. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2025.

1.03 DEFINITIONS

- A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.
- B. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
 - 1. Design Services Types Required:
 - a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor's sole responsibilities for construction means, methods, techniques, sequences, and procedures.
 - b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.
- C. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
 - 1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
 - a. Full name.
 - b. Professional licensure information.

SECTION 01 4000 QUALITY REQUIREMENTS

- c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.
- C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
 1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
 2. Include required product data and shop drawings.
 3. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
- D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
 2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- G. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
 1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
- H. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
 1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
 2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

SECTION 01 4000 QUALITY REQUIREMENTS

3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.
- B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.07 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Contractor Employed Agency:
 1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740
 2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
 3. Laboratory: Authorized to operate in the State in which the Project is located.
 4. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

SECTION 01 4000 QUALITY REQUIREMENTS

3.02 MOCK-UPS

- A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
- B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
- C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.
- D. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.
- E. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- F. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- G. Architect will use accepted mock-ups as a comparison standard for the remaining Work.
- H. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

- A. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.

SECTION 01 4000 QUALITY REQUIREMENTS

- d. To provide storage and curing of test samples.
- 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
- 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

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SECTION 01 4533 CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Code-required special inspections.
- B. Testing services incidental to special inspections.
- C. Submittals.
- D. Manufacturers' field services.
- E. Fabricators' field services.

1.02 RELATED REQUIREMENTS

1.03 DEFINITIONS

- A. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located.
- B. Special Inspection:
 - 1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the AHJ that also require special expertise to ensure compliance with the approved Contract Documents and the referenced standards.
 - 2. Special inspections are separate from and independent of tests and inspections conducted by Owner or Contractor for the purposes of quality assurance and contract administration.

1.04 REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete; 2019 (Reapproved 2022).
- A. ACI CODE-318 - Building Code for Structural Concrete—Code Requirements and Commentary; 2025.
- B. AISC 360 - Specification for Structural Steel Buildings; 2022, with Errata (2025).
- C. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2026a.
- D. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2025.
- E. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.
- F. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2025b.
- G. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993, with Editorial Revision (2015).
- H. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2017.
- I. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.
- J. ICC (IBC)-2018 - International Building Code; 2018.
- K. SDI QA/QC - Standard for Quality Control and Quality Assurance for Installation of Steel Deck; 2022.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency is required to:
 - 1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 - 3. Submit certification that Special Inspection Agency is acceptable to AHJ.

SECTION 01 4533 CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

- C. Testing Agency Qualifications: Prior to the start of work, the Testing Agency is required to:
 - 1. Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 - 3. Submit certification that Testing Agency is acceptable to AHJ.
- D. Manufacturer's Qualification Statement: Manufacturer is required to submit documentation of manufacturing capability and quality control procedures. Include documentation of AHJ approval.
- E. Fabricator's Qualification Statement: Fabricator is required to submit documentation of fabrication facilities and methods as well as quality control procedures. Include documentation of AHJ approval.
- F. Special Inspection Reports: After each special inspection, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one to the AHJ.
- G. Fabricator Special Inspection Reports: After each special inspection of fabricated items at the Fabricator's facility, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one to AHJ.
- H. Test Reports: After each test or inspection, promptly submit at least two copies of report; one to Architect and one to AHJ.
- I. Manufacturer's Field Reports: Submit reports to Architect and AHJ.
 - 1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in Contract Documents.

1.06 SPECIAL INSPECTION AGENCY

- A. Owner or Architect will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code.
- B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.07 TESTING AND INSPECTION AGENCIES

- A. Owner or Architect may employ services of an independent testing agency to perform additional testing and sampling associated with special inspections but not required by the building code.
- B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.08 QUALITY ASSURANCE

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL

- A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
 - 1. Continuous Special Inspection: Special Inspection Agency is required to be present in the area where the work is being performed and observe the work at all times the work is in progress.
 - 2. Periodic Special Inspection: Special Inspection Agency is required to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

3.02 SPECIAL INSPECTIONS FOR STEEL CONSTRUCTION

- A. Structural Steel: Comply with quality assurance inspection requirements of ICC (IBC)-2018.
- B. Cold-Formed Steel Deck: Comply with quality assurance inspection requirements of SDI QA/QC.
 - 1. End Connections - Welding or Bolted: Comply with requirements of SJI 100; periodic.
 - 2. Bridging - Horizontal or Diagonal:
 - a. Standard Bridging: Comply with requirements of SJI 100; periodic.

SECTION 01 4533 CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

3.03 SPECIAL INSPECTIONS FOR CONCRETE CONSTRUCTION

- A. Reinforcement, Including Prestressing Tendons, and Verification of Placement: Verify compliance with ACI CODE-318, Chapters 20, 25.2, 25.3, 26.6.1-26.6.3; periodic.
- B. Reinforcing Bar Welding: Verify compliance with AWS D1.4/D1.4M and ACI CODE-318, 26.6.4; periodic.
- C. Anchors Cast in Concrete: Verify compliance with ACI CODE-318; periodic.
- D. Bolts Installed in Concrete: Where allowable loads have been increased or where strength design is used, verify compliance with approved Contract Documents and ACI CODE-318, Sections 8.1.3 and 21.2.8 prior to and during placement of concrete; continuous.
- E. Anchors Post-Installed in Hardened Concrete: Verify compliance with ACI CODE-318.
- F. Design Mix: Verify plastic concrete complies with the design mix in approved Contract Documents and with ACI CODE-318, Chapter 19, 16.4.3, 26.4.4; periodic.
- G. Concrete Sampling Concurrent with Strength Test Sampling: Each time fresh concrete is sampled for strength tests, verify compliance with ASTM C172/C172M, ASTM C31/C31M, and ACI CODE-318, Chapter 26.5, 26.12, and record the following, continuous:
 - 1. Slump.
 - 2. Air content.
 - 3. Temperature of concrete.
- H. Concrete and Shotcrete Placement: Verify application techniques comply with approved Contract Documents and ACI CODE-318, Chapter 26.5; continuous.

3.04 SPECIAL INSPECTIONS FOR MASONRY CONSTRUCTION

- A. Masonry Structures Subject to Special Inspection:
 - 1. Empirically designed masonry, glass unit masonry and masonry veneer in structures designated as "essential facilities".
 - 2. Engineered masonry in structures classified as "low hazard..." and "substantial hazard to human life in the event of failure".
- B. Verify each item below complies with approved Contract Documents and the applicable articles of TMS 402/602.
 - 1. Inspections and Approvals:
 - a. Verify compliance with the required inspection provisions of the approved Contract Documents; periodic.
 - b. Verify approval of submittals required by Contract Documents; periodic.
 - 2. Compressive Strength of Masonry: Verify compressive strength of masonry units prior to start of construction unless specifically exempted by code; periodic.
 - 3. Slump Flow and Visual Stability Index (VSI): Verify compliance as self consolidating grout arrives on site; continuous.
 - 4. Joints and Accessories: When masonry construction begins, verify:
 - a. Proportions of site prepared mortar; periodic.
 - b. Construction of mortar joints; periodic.
 - c. Location of reinforcement, connectors, prestressing tendons, anchorages, etc; periodic.
 - 5. Structural Elements, Joints, Anchors, Protection: During masonry construction, verify:
 - a. Size and location of structural elements; periodic.
 - b. Type, size and location of anchors, including anchorage of masonry to structural members, frames or other construction; periodic.
 - c. Size, grade and type of reinforcement, anchor bolts and prestressing tendons and anchorages; periodic.
 - d. Welding of reinforcing bars; continuous.
 - 6. Grouting Preparation: Prior to grouting, verify:
 - a. Grout space is clean; periodic.
 - b. Correct placement of reinforcing, connectors, prestressing tendons and anchorages; periodic.
 - c. Correctly proportioned site prepared grouts and prestressing grout for bonded tendons; periodic.

SECTION 01 4533 CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

d. Correctly constructed mortar joints; periodic.

7. Preparation of Grout Specimens, Mortar Specimens and Prisms: Observe preparation of specimens; periodic.

3.05 SPECIAL INSPECTIONS FOR SOILS

- A. Materials and Placement: Verify each item below complies with approved construction documents and approved geotechnical report.
 - 1. Design bearing capacity of material below shallow foundations; periodic.
 - 2. Design depth of excavations and suitability of material at bottom of excavations; periodic.
 - 3. Materials, densities, lift thicknesses; placement and compaction of backfill: continuous.
 - 4. Subgrade, prior to placement of compacted fill verify proper preparation; periodic.
- B. Testing: Classify and test excavated material; periodic.

3.06 SPECIAL INSPECTIONS FOR SPRAYED FIRE RESISTANT MATERIALS

- A. Sprayed Fire Resistant Materials, General:
 - 1. Verify compliance of sprayed-fire resistant materials with specific fire-rated assemblies indicated in approved Contract Documents, and with applicable requirements of the building code.
 - 2. Perform special inspections after rough installation of electrical, mechanical, plumbing, automatic fire sprinkler and suspension systems for ceilings.
- B. Physical and visual tests: Verify compliance with fire resistance rating.
 - 1. Condition of substrates; periodic.
 - 2. Thickness of sprayed fire resistant material; periodic.
 - 3. Density of sprayed fire resistant material in pounds per cubic foot; periodic.
 - 4. Bond strength (adhesion and cohesion); periodic.
 - 5. Condition of finished application; periodic.
- C. Structural member surface conditions:
 - 1. Inspect structural member surfaces before application of sprayed fire resistant materials; periodic.
 - 2. Verify preparation of structural member surfaces complies with approved Contract Documents and manufacturer's written instructions; periodic.
- D. Application:
 - 1. Ensure minimum ambient temperature before and after application complies with the manufacturer's written instructions; periodic.
 - 2. Verify area where sprayed fire resistant material is applied is ventilated as required by the manufacturer's written instructions during and after application; periodic.
- E. Thickness: Verify that no more than 10 percent of thickness measurements taken from sprayed fire resistant material are less than thickness required by fire resistance design in approved Contract Documents. In no case shall the thickness of the sprayed fire resistant material be less than the minimum below.
 - 1. Minimum Allowable Thickness: Tested according to ASTM E605/E605M, periodic.
 - a. Design thickness 1 inch or greater: Design thickness minus 1/4 inch.
 - b. Design thickness greater than 1 inch: Design thickness minus 25 percent.
- F. Density: Verify density of sprayed fire resistant material is no less than density required by the fire resistance design in the approved Contract Documents.
- G. Bond Strength: Verify adhesive and cohesive bond strength of sprayed fire resistant materials is no less than 150 pounds per square foot when in-place samples of the cured material are tested according to ASTM E736/E736M and as described below.

3.07 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

- A. Special Inspection Agency shall:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified reference standards.
 - 3. Ascertain compliance of materials and products with requirements of Contract Documents.

SECTION 01 4533 CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
 5. Perform additional tests and inspections required by Architect.
 6. Submit reports of all tests or inspections specified.
- B. Limits on Special Inspection Agency Authority:
- C. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- D. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.08 TESTING AGENCY DUTIES AND RESPONSIBILITIES

- A. Testing Agency Duties:
1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 2. Perform specified sampling and testing of products in accordance with specified standards.
 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
 5. Perform additional tests and inspections required by Architect.
 6. Submit reports of all tests or inspections specified.
- B. Limits on Testing or Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Agency may not approve or accept any portion of the work.
 3. Agency may not assume any duties of Contractor.
 4. Agency has no authority to stop the work.
- C. On instructions by Architect, perform re-testing required because of non-compliance with specified requirements, using the same agency.
- D. Contractor will pay for re-testing required because of non-compliance with specified requirements.

3.09 CONTRACTOR DUTIES AND RESPONSIBILITIES

- A. Contractor Responsibilities, General:
1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
 2. Cooperate with agency and laboratory personnel; provide access to approved documents at project site, to the work, to manufacturers' facilities, and to fabricators' facilities.
 3. Provide incidental labor and facilities:
 - a. To provide access to work to be tested or inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
 - c. To facilitate tests or inspections.
 - d. To provide storage and curing of test samples.
 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.
 5. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

3.10 MANUFACTURERS' AND FABRICATORS' FIELD SERVICES

- A. When specified in individual specification sections, require material suppliers, assembly fabricators, or product manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, to test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

END OF SECTION

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SECTION 01 5000 TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Security requirements.
- F. Vehicular access and parking.
- G. Waste removal facilities and services.
- H. Project identification sign.

1.02 TEMPORARY UTILITIES

- A. Owner will provide the following:
 - 1. Electrical power and metering, consisting of connection to existing facilities.
 - 2. Water supply, consisting of connection to existing facilities.

1.03 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Telephone Lines: One line, minimum; one handset per line.
 - 2. Email: Account/address reserved for project use.
- C. Architect will pay for own telecommunications services.

1.04 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Use of existing facilities is permitted.
- C. Maintain daily in clean and sanitary condition.
- D. At end of construction, return facilities to same or better condition as originally found.

1.05 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.
- C. Provide GC signage notifying site occupants materials and other items stored within your fencing belongs to you. The adjacent area is also used for GUC internal storage.

1.06 INTERIOR ENCLOSURES

- A. Provide temporary partitions as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.
- B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces:

1.07 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.08 VEHICULAR ACCESS AND PARKING - SEE SECTION 01 5500

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.

SECTION 01 5000 TEMPORARY FACILITIES AND CONTROLS

- E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.09 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.10 PROJECT IDENTIFICATION

- A. Provide project identification sign of design and construction indicated on drawings.
- B. No other signs are allowed without Owner permission except those required by law.

1.11 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 6000 PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations.
- F. Procedures for Owner-supplied products.
- G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- B. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.
- C. Section 23 0513 - Common Motor Requirements for HVAC Equipment: Motors for HVAC equipment.

1.03 REFERENCE STANDARDS

- A. NEMA MG 00001 - Motors and Generators; 2024.

1.04 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
 - 1. Made using or containing CFC's or HCFC's.
 - 2. Containing lead, cadmium, or asbestos.
- C. Where other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Section 01 6116.
 - 2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
- D. Motors: Refer to Section 23 0513 - Common Motor Requirements for HVAC Equipment, NEMA MG 00001 Type. Specific motor type is specified in individual specification sections.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

SECTION 01 6000 PRODUCT REQUIREMENTS

- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions:
Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 2500 - Substitution Procedures.

3.02 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.
- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 7000 EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Starting of systems and equipment.
- H. Demonstration and instruction of Owner personnel.
- I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.
- E. Section 01 5000 - Temporary Facilities and Controls: Temporary interior partitions.
- F. Section 01 7419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- G. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 QUALIFICATIONS

- A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,
- B. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.05 PROJECT CONDITIONS

- A. Use of explosives is not permitted.

SECTION 01 7000 EXECUTION AND CLOSEOUT REQUIREMENTS

- B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- C. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 1. Indoors: Limit conduct of especially noisy interior work to the hours of 6 pm to 7 am.
- D. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.06 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.

SECTION 01 7000 EXECUTION AND CLOSEOUT REQUIREMENTS

- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- F. Utilize recognized engineering survey practices.
- G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- H. Periodically verify layouts by same means.
- I. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 .
- C. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove items indicated on drawings.
 - 2. Relocate items indicated on drawings.

SECTION 01 7000 EXECUTION AND CLOSEOUT REQUIREMENTS

3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. See Section 01 1000 for other limitations on outages and required notifications.
 - c. Provide temporary connections as required to maintain existing systems in service.
 4. Verify that abandoned services serve only abandoned facilities.
 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- E. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
- F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
- G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- H. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- I. Clean existing systems and equipment.
- J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- K. Do not begin new construction in alterations areas before demolition is complete.
- L. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
 1. Complete the work.
 2. Fit products together to integrate with other work.
 3. Provide openings for penetration of mechanical, electrical, and other services.
 4. Match work that has been cut to adjacent work.
 5. Repair areas adjacent to cuts to required condition.

SECTION 01 7000 EXECUTION AND CLOSEOUT REQUIREMENTS

6. Repair new work damaged by subsequent work.
 7. Remove samples of installed work for testing when requested.
 8. Remove and replace defective and non-complying work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
 - E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
 - F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
 - G. Restore work with new products in accordance with requirements of Contract Documents.
 - H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
 - I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.
 - J. Patching:
 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 2. Match color, texture, and appearance.
 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.

SECTION 01 7000 EXECUTION AND CLOSEOUT REQUIREMENTS

- E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

- A. See Section 01 7900 - Demonstration and Training.

3.12 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

3.13 FINAL CLEANING

- A. Use cleaning materials that are nonhazardous.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.

SECTION 01 7000 EXECUTION AND CLOSEOUT REQUIREMENTS

- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

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PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Owner may decide to pay for additional recycling, salvage, and/or reuse based on Landfill Alternatives Proposal specified below.
- E. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, incineration, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.
- F. Develop and follow a Waste Management Plan designed to implement these requirements.
- G. The following sources may be useful in developing the Waste Management Plan:
- H. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- I. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

SECTION 01 7419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Waste Management Plan: Include the following information:
 - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
 - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
 - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 - 4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
 - 5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 - 6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

PART 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

- A. See Section 01 6000 and Section 01 2500.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 6000:
 - 1. Relative amount of waste produced, compared to specified product.
 - 2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Price.
 - 3. Proposed disposal method for waste product.
 - 4. Markets for recycled waste product.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Prebid meeting.
 - 2. Preconstruction meeting.
 - 3. Regular job-site meetings.

SECTION 01 7419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. Provide containers as required.
 - 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

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SECTION 01 7800 CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project record documents.
- B. Operation and maintenance data.
- C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Individual Product Sections: Specific requirements for operation and maintenance data.
- C. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Field changes of dimension and detail.
 - 2. Details not on original Contract drawings.

SECTION 01 7800 CLOSEOUT SUBMITTALS

3.02 OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Additional information as specified in individual product specification sections.
- D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- D. Include color coded wiring diagrams as installed.
- E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- G. Provide servicing and lubrication schedule, and list of lubricants required.
- H. Include manufacturer's printed operation and maintenance instructions.
- I. Include sequence of operation by controls manufacturer.
- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Include test and balancing reports.
- M. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

SECTION 01 7800 CLOSEOUT SUBMITTALS

- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

3.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.

END OF SECTION

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SECTION 01 7900 DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

- A. Demonstration of products and systems where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment.
 - 3. Plumbing equipment.
 - 4. Electrical systems and equipment.
 - 5. Items specified in individual product Sections.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Finishes, including flooring, wall finishes, ceiling finishes.
 - 2. Fixtures and fittings.
 - 3. Items specified in individual product Sections.

1.02 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit to Architect for transmittal to Owner.
 - 2. Submit not less than two weeks prior to start of training.
 - 3. Revise and resubmit until acceptable.
 - 4. Provide an overall schedule showing all training sessions.
 - 5. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.
 - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.
- D. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
 - 1. Format: USB drive
 - 2. Label each USB drive with session identification and date.

1.03 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
 - 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
 - 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

SECTION 01 7900 DEMONSTRATION AND TRAINING

- B. Demonstration may be combined with Owner personnel training if applicable.
- C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 - 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

- A. Conduct training on-site unless otherwise indicated.
- B. Owner will provide classroom and seating at no cost to Contractor.
- C. Provide training in minimum two hour segments.
- D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 - 3. Typical uses of the O&M manuals.
- F. Product- and System-Specific Training:
 - 1. Review the applicable O&M manuals.
 - 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 - 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 - 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 - 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 - 6. Discuss common troubleshooting problems and solutions.
 - 7. Discuss any peculiarities of equipment installation or operation.
 - 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 - 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 - 10. Review spare parts and tools required to be furnished by Contractor.
 - 11. Review spare parts suppliers and sources and procurement procedures.
- G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 02 4100 - DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- D. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- E. Section 01 7419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

1.03 REFERENCE STANDARDS

- A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Site Plan: Indicate:
 - 1. Areas for temporary construction and field offices.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 3 EXECUTION

2.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 3. Provide, erect, and maintain temporary barriers and security devices.
 - 4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 5. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
 - 6. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
 - 7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Protect existing structures and other elements to remain in place and not removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
- D. Hazardous Materials:
 - 1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.

SECTION 02 4100 DEMOLITION

- E. Perform demolition in a manner that maximizes salvage and recycling of materials.
 - 1. Comply with requirements of Section 01 7419 - Construction Waste Management and Disposal.
 - 2. Dismantle existing construction and separate materials.
 - 3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

2.02 EXISTING UTILITIES

- A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

2.03 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
 - 1. Verify construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Separate areas in which demolition is being conducted from areas that remain occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.
- C. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.
- D. Remove existing work as indicated and required to accomplish new work.
 - 1. Remove items indicated on drawings.
- E. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
 - 1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
 - 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - 3. Verify that abandoned services serve only abandoned facilities before removal.
 - 4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.
- F. Protect existing work to remain.
 - 1. Prevent movement of structure. Provide shoring and bracing as required.
 - 2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch to match new work.

2.04 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.

SECTION 02 4100 DEMOLITION

- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

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SECTION 03 1000 CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form stripping.

1.02 RELATED REQUIREMENTS

- A. Section 03 2000 - Concrete Reinforcing.
- B. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Concrete Construction; 2020.
- B. ACI 318 - Building Code Requirements for Structural Concrete; 2019 (Reapproved 2022).
- C. ACI 347R - Guide to Formwork for Concrete; 2014 (Reapproved 2021).
- D. ASME A17.1 - Safety Code for Elevators and Escalators Includes Requirements for Elevators, Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices; 2025.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.
- B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.
- C. Protect plastic foam products from damage and exposure to sunlight.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.
- C. Chamfer outside corners of beams, joists, columns, and walls.
- D. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.
- E. Comply with relevant portions of ACI CODE-318, ACI PRC-347, and ACI SPEC-301.

2.02 WOOD FORM MATERIALS

- A. Form Materials: At the discretion of the Contractor.

2.03 FORMWORK ACCESSORIES

- A. Form Ties: Removable type, galvanized metal, fixed length, cone type, with waterproofing washer, free of defects that could leave holes larger than 1 inch in concrete surface.
- B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
 - 1. Do not use materials containing diesel oil or petroleum-based compounds.
 - 2. Composition: Colorless, reactive, solvent-based compound.
 - a. VOC Content: In compliance with applicable local, State, and federal regulations.
- C. Dowel Sleeves: Plastic sleeve and nailable plastic base for smooth, round, steel load-transfer dowels.
- D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- E. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 1200.
- F. Waterstops: Bentonite and butyl rubber.
 - 1. Configuration: As indicated on drawings.
 - 2. Size: As indicated on drawings.
 - 3. Manufacturers:

SECTION 03 1000 CONCRETE FORMING AND ACCESSORIES

- a. AVM Industries, Inc; Aussie Swell Red: www.avmindustries.com/#sle.
- b. Cetco, a Mineral Technologies Company; Waterstop-RX: www.mineralstech.com
- c. GCP Applied Technologies; Adcor ES: www.gcpat.com
- d. WR Medows; Waterstop EC Plus; www.wrmedows.com.
- e. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

- A. Earth forms are not permitted.

3.03 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI SPEC-301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.

3.04 APPLICATION - FORM RELEASE AGENT

- A. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement.
- F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- G. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.06 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
 1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
 2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.07 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI SPEC-117, unless otherwise indicated.

3.08 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

SECTION 03 1000 CONCRETE FORMING AND ACCESSORIES

- B. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

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SECTION 03 2000 CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

- A. Section 03 1000 - Concrete Forming and Accessories.
- B. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. ACI CODE-318 - Building Code for Structural Concrete—Code Requirements and Commentary; 2025.
- B. ACI MNL-66 - ACI Detailing Manual; 2020.
- C. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2026.
- E. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2026.
- F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.
- G. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.
- H. CRSI (DA4) - Manual of Standard Practice; 2024.
- I. CRSI (P1) - Placing Reinforcing Bars, 10th Edition; 2019.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
- C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI SPEC-301.

PART 2 PRODUCTS

2.01 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Deformed billet-steel bars.
 - 2. Unfinished.
- B. Steel Welded Wire Reinforcement (WWR): Plain type; ASTM A1064/A1064M.
 - 1. Form: Flat Sheets.
 - 2. WWR Style: As indicated on drawings.
- C. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - 3. Provide stainless steel, galvanized, or plastic components for placement within 1-1/2 inches of weathering surfaces.

2.02 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
- B. Welding of reinforcement is permitted only with the specific approval of Architect. Perform welding in accordance with AWS D1.4/D1.4M.
- C. Locate reinforcing splices not indicated on drawings at point of minimum stress.

SECTION 03 2000 CONCRETE REINFORCING

PART 3 EXECUTION

3.01 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Accommodate placement of formed openings.
- C. Comply with applicable code for concrete cover over reinforcement.

3.02 FIELD QUALITY CONTROL

- A. An independent testing agency, as specified in Section 01 4000 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.

END OF SECTION

SECTION 03 3000 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete for composite floor construction.
- B. Floors and slabs on grade.
- C. Concrete foundation walls and footings.
- D. Joint devices associated with concrete work.
- E. Miscellaneous concrete elements, including equipment pads.
- F. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.
- B. Section 03 2000 - Concrete Reinforcing.

1.03 REFERENCE STANDARDS

- A. ACI 211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.
- B. ACI 301 - Specifications for Concrete Construction; 2020.
- C. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.
- D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- E. ACI 305R - Guide to Hot Weather Concreting; 2020.
- F. ACI 306R - Guide to Cold Weather Concreting; 2016.
- G. ACI 308R - Guide to External Curing of Concrete; 2016.
- H. ACI 318 - Building Code Requirements for Structural Concrete; 2019 (Reapproved 2022).
- I. ACI CODE-318 - Building Code for Structural Concrete—Code Requirements and Commentary; 2025.
- J. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.
- K. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.
- L. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- M. ACI PRC-305 - Guide to Hot Weather Concreting; 2020.
- N. ACI PRC-306 - Guide to Cold Weather Concreting; 2016.
- O. ACI PRC-308 - Guide to External Curing of Concrete; 2016.
- P. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- Q. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.
- R. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.
- S. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2026a.
- T. ASTM C143/C143M - Standard Test Method for Slump of Concrete; 2026a.
- U. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- V. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.
- W. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2024.
- X. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2025.
- Y. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2024.
- Z. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2025a.

SECTION 03 3000 CAST-IN-PLACE CONCRETE

- AA. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2025a.
- BB. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2020a.
- CC. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.
- DD. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2023.
- EE. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2020.
- FF. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2025.
- GG. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2018.
- HH. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types); 2023.
- II. ASTM E1155/E1155M - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2023.
- JJ. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2024.
- KK. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).
- LL. COE CRD-C 48 - Handbook for Concrete and Cement Standard Test Method for Water Permeability of Concrete; 1992.
- MM. COE CRD-C 572 - Handbook for Concrete and Cement Corps of Engineers Specifications for Polyvinylchloride Waterstop; 1974.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
- C. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate proposed mix design complies with requirements of ACI CODE-318, Chapter 5 - Concrete Quality, Mixing and Placing.
- D. Test Reports: Submit report for each test or series of tests specified.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.
- B. Follow recommendations of ACI PRC-305 when concreting during hot weather.
- C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Comply with requirements of Section 03 1000.

2.02 REINFORCEMENT MATERIALS

- A. Comply with requirements of Section 03 2000.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type or ASTM C595/C595M, Type IL - Portland Limestone cement
 - 1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
- C. Fly Ash: ASTM C618, Class C or F.
- D. Calcined Pozzolan: ASTM C618, Class N.

SECTION 03 3000 CAST-IN-PLACE CONCRETE

- E. Silica Fume: ASTM C1240, proportioned in accordance with ACI PRC-211.1.
- F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.
- G. Structural Fiber Reinforcement: ASTM C1116/C1116M.
 - 1. Fiber Type: Alkali-resistant synthetic.
 - 2. Products:
 - a. Fibermesh; Fibermesh 300 @ 1.5 pounds per cubic yard: www.fibermesh.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
- E. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
- F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- G. Water Reducing Admixture: ASTM C494/C494M Type A.
- H. Waterproofing Admixture: Admixture formulated to reduce permeability to liquid water, with no adverse effect on concrete properties.
 - 1. Admixture Composition: Crystalline, functioning by growth of crystals in capillary pores.
 - 2. Permeability of Cured Concrete: No measurable leakage when tested in accordance with COE CRD-C 48 at 200 psi; provide test reports.
 - 3. Products:
 - a. Kryton International, Inc; Krystol Internal Membrane (KIM): www.kryton.com/#sle.
 - b. Penetron; PENETRON ADMIX SB: www.penetron.com/#sle.
 - c. Xypex Chemical Corporation; Bio-San C500: www.xypex.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder:
 - 1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited.
 - 2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
 - 3. Products:
 - a. Fortifiber Building Systems Group ; Moistop Ultra 10: www.fortifiber.com.
 - b. Henry Company; Moistop Ultra 10: www.henry.com/#sle.
 - c. ISI Building Products; Viper VaporCheck II 10-mil (Class A): www.isibp.com/#sle.
 - d. Poly-America; Husky Yellow Guard Class A 10-mil Vapor Barrier: www.yellowguard.com/#sle.
 - e. Reef Industries; Vaporguard: www.reefindustries.com
 - f. Stego Industries, LLC; Stego Wrap Class A - 10 mils (0.25 mm): www.stegoindustries.com/#sle.
 - g. W. R. Meadows, Inc; PERMINATOR Class A - 10 mils (0.25 mm): www.wrmeadows.com/#sle.
 - h. Substitutions: See Section 01 6000 - Product Requirements.

2.06 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
- B. Epoxy Bonding System:
 - 1. Complying with ASTM C881/C881M and of Type required for specific application.
- C. Waterstops: PVC, complying with COE CRD-C 572.
 - 1. Configuration: As indicated on drawings.
 - 2. Size: As indicated on drawings.

SECTION 03 3000 CAST-IN-PLACE CONCRETE

3. Products:
 - a. BoMetals, Inc: www.bometals.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

D. Slab Isolation Joint Filler: 1/2-inch thick, height equal to slab thickness, with removable top section forming 1/2-inch deep sealant pocket after removal.

1. Material: ASTM D1751, cellulose fiber.

2.07 CURING MATERIALS

A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.

B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.

C. Curing and Sealing Compound, Moisture Emission-Reducing, Membrane-Forming: Clear, liquid sealer for application to newly-placed concrete; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission.

1. Use this product to cure and seal all slabs to receive adhesively applied flooring or roofing.
2. Comply with ASTM C309 and ASTM C1315 Type I Class A.
3. VOC Content: Less than 100 g/L.
4. Solids Content: 25 percent, minimum.

D. Moisture-Retaining Sheet: ASTM C171.

1. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.
2. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.

E. Water: Potable, not detrimental to concrete.

2.08 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI SPEC-301.

1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Normal Weight Concrete:

1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on drawings.
2. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.
3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
5. Maximum Aggregate Size: 5/8 inch.

2.09 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C94/C94M.

C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.

1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.

SECTION 03 3000 CAST-IN-PLACE CONCRETE

2. Use latex bonding agent only for non-load-bearing applications.
- B. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
 1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.03 PLACING CONCRETE

- A. Place concrete in accordance with ACI PRC-304.
- B. Place concrete for floor slabs in accordance with ACI PRC-302.1.
- C. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- D. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.
- E. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.04 SLAB JOINTING

- A. Locate joints as indicated on drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
- D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

3.05 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. An independent testing agency, as specified in Section 01 4000, will inspect finished slabs for compliance with specified tolerances.
- B. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155/E1155M, within 48 hours after slab installation; report both composite overall values and local values for each measured section.
- C. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.
- D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.06 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
 1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal. Smooth rubbed finish to be used when finish is not indicated in drawings.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.
- E. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
 1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI PRC-302.1; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.

SECTION 03 3000 CAST-IN-PLACE CONCRETE

2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI PRC-302.1; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
3. Decorative Exposed Surfaces: Trowel as described in ACI PRC-302.1; take measures necessary to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, surfaces to receive liquid hardeners, surfaces to receive dry-shake hardeners, surfaces to be polished, and all other exposed slab surfaces.

- F. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.07 CURING AND PROTECTION

- A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 1. Normal concrete: Not less than seven days.
- C. Surfaces Not in Contact with Forms:
 1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
 2. Final Curing: Begin after initial curing but before surface is dry.
 - a. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.08 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- D. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
- E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.09 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.10 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 04 0511 MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Mortar for masonry.
- B. Grout for masonry.

1.02 RELATED REQUIREMENTS

- A. Section 04 2000 - Unit Masonry: Installation of mortar and grout.
- B. Section 08 1113 - Hollow Metal Doors and Frames: Products and execution for grouting steel door frames installed in masonry.

1.03 REFERENCE STANDARDS

- A. ASTM C91/C91M - Standard Specification for Masonry Cement; 2025.
- B. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2026a.
- C. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2025b.
- D. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- E. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2025a.
- F. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2024.
- G. ASTM C1019 - Standard Test Method for Sampling and Testing Grout for Masonry; 2026.
- H. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2025.
- I. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include design mix and indicate Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.
- C. Samples: Submit two samples of mortar, illustrating mortar color and color range.
- D. Reports: Submit reports on mortar indicating compliance of mortar to property requirements of ASTM C270 and test and evaluation reports per ASTM C780.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 PRECONSTRUCTION TESTING

- A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01 4000 - Quality Requirements.
- B. Mortar Mixes: Test mortars prebatched by weight in accordance with ASTM C780 recommendations for preconstruction testing.
 - 1. Test results will be used to establish optimum mortar proportions and establish quality control values for construction testing.
- C. Grout Mixes: Test grout batches in accordance with ASTM C1019 procedures.
 - 1. Test results will be used to establish optimum grout proportions and establish quality control values for construction testing.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.07 FIELD CONDITIONS

- A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT APPLICATIONS

- A. Use only factory premixed packaged dry materials for mortar and grout, with addition of water only at project site.

SECTION 04 0511 MASONRY MORTARING AND GROUTING

- B. Mortar Color: Natural gray unless otherwise indicated.
- C. Mortar Mix Designs: ASTM C270, Property Specification.
 - 1. Exterior Masonry Veneer: Type N.
 - 2. Exterior, Non-loadbearing Masonry: Type N.
 - 3. Interior, Loadbearing Masonry: Type S.
 - 4. Interior, Non-loadbearing Masonry: Type N.
- D. Grout Mix Designs:
 - 1. Bond Beams and Lintels: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
 - a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
 - b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
 - 2. Engineered Masonry: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
 - a. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
 - b. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.02 MATERIALS

- A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
- B. Packaged Dry Material for Mortar for Stone: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C387/C387M, premixed masonry cement and mason's sand; complying with ASTM C387/C387M, or premixed mortar cement and mason's sand; complying with ASTM C387/C387M and C1329 and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 - 1. Type: Building stone masonry mortar for hard stone.
 - a. Compressive strength at 28 days: 1800 minimum psi.
 - 2. Color: Mineral pigments added as required to produce approved color sample.
 - 3. Manufacturers:
 - a. Spec Mix, LLC; Building Stone Mortar, Hard: www.specmix.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- C. Packaged Dry Material for Mortar for Repointing: Premixed Portland cement, graded sand, and chemical admixtures complying with ASTM C91/C91M with the addition of water only.
 - 1. Color: To match adjacent mortar color.
- D. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.
- E. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
 - 1. Color(s): As scheduled.
 - 2. Manufacturers:
 - a. Davis Colors: www.daviscolors.com/#sle.
 - b. Lambert Corporation: www.lambertusa.com/#sle.
 - c. Solomon Colors; Solomon Colors Concentrated A, H, and X Series: www.solomoncolors.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- F. Water: Clean and potable.
- G. Accelerating Admixture: Nonchloride type for use in cold weather.

2.03 MORTAR MIXING

- A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.
- B. Maintain sand uniformly damp immediately before the mixing process.
- C. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio; mix in accordance with manufacturer's instructions, uniform in coloration.

SECTION 04 0511 MASONRY MORTARING AND GROUTING

- D. Do not use anti-freeze compounds to lower the freezing point of mortar.
- E. If water is lost by evaporation, re-temper only within two hours of mixing.

2.04 GROUT MIXING

- A. Mix grout in accordance with ASTM C94/C94M.
- B. Add admixtures in accordance with manufacturer's instructions; mix uniformly.
- C. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.01 PREPARATION

- A. Plug clean-out holes for grouted masonry with block masonry units. Brace masonry to resist wet grout pressure.

3.02 INSTALLATION

- A. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.

3.03 GROUTING

- A. Perform all grouting by means of low-lift technique. Do not employ high-lift grouting.
- B. Low-Lift Grouting:
 - 1. Limit height of pours to 12 inches.
 - 2. Limit height of masonry to 16 inches above each pour.
 - 3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
 - 4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

3.04 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field tests, in accordance with provisions of Section 01 4000 - Quality Requirements.
- B. Test and evaluate mortar in accordance with ASTM C780 procedures.
- C. Test and evaluate grout in accordance with ASTM C1019 procedures.

END OF SECTION

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SECTION 04 2000 UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block.
- B. Mortar and grout.
- C. Reinforcement and anchorage.
- D. Lintels.
- E. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 04 0511 - Masonry Mortaring and Grouting.
- B. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2026.
- B. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019 (Reapproved 2025).
- C. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2026.
- D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.
- E. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2025.
- F. ASTM C90 - Standard Specification for Dry-Cast Loadbearing Concrete Masonry Units; 2024a.
- G. ASTM C91/C91M - Standard Specification for Masonry Cement; 2025.
- H. ASTM C129 - Standard Specification for Dry-Cast Nonloadbearing Concrete Masonry Units; 2025.
- I. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2026.
- J. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2025.
- K. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2026.
- L. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2025b.
- M. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.
- N. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- O. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
- P. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Samples: Submit two samples of facing brick units to illustrate color, texture, and extremes of color range.
- D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
 - 1. Maintain one copy of each document on project site.

SECTION 04 2000 UNIT MASONRY

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depth of 8 inches.
 - 2. Load-Bearing Units: ASTM C90, normal weight.
 - a. Hollow block.
 - b. Exposed Faces: Match adjacent existing construction color and texture.
 - c. Pattern: Match adjacent existing construction..
 - 3. Nonloadbearing Units: ASTM C129.
 - a. Hollow block.
 - b. Normal weight.

2.02 MORTAR AND GROUT MATERIALS

- A. Mortar and Grout: As specified in Section 04 0511.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:
 - 1. Blok-Lok Limited: www.blok-lok.com/#sle.
 - 2. Hohmann & Barnard, Inc; X-Seal Anchor: www.h-b.com/#sle.
 - 3. WIRE-BOND: www.wirebond.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; galvanized.
- C. Single Wythe Joint Reinforcement: ASTM A951/A951M.
 - 1. Type: Truss or ladder.
 - 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
 - 3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

2.04 ACCESSORIES

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
 - 1. Manufacturers:
 - a. Blok-Lok Limited: www.blok-lok.com/#sle.
 - b. Hohmann & Barnard, Inc: www.h-b.com/#sle.
 - c. WIRE-BOND: www.wirebond.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc: www.h-b.com/#sle.
 - b. WIRE-BOND: www.wirebond.com/#sle.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
- C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
- D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.05 LINTELS

2.06 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
 - 1. Interior, loadbearing masonry: Type N.
 - 2. Interior, non-loadbearing masonry: Type O.

SECTION 04 2000 UNIT MASONRY

- B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
- C. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.04 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- H. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.
- I. Isolate masonry partitions from vertical structural framing members with a control joint.
- J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.06 WEEPS/CAVITY VENTS

- A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

3.07 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

SECTION 04 2000 UNIT MASONRY

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

3.09 LINTELS

- A. Install loose steel lintels over openings.

3.10 GROUDED COMPONENTS

- A. Lap splices minimum 24 bar diameters.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- C. Place and consolidate grout fill without displacing reinforcing.

3.11 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.
- D. Form expansion joint as detailed on drawings.

3.12 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
 - 1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

3.13 TOLERANCES

3.14 CUTTING AND FITTING

- A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67/C67M requirements, sampling 5 randomly chosen units for each 50,000 installed.
- C. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.

3.16 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

SECTION 04 2000 UNIT MASONRY

3.17 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

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SECTION 05 1200 STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural steel framing members.
- B. Base plates, shear stud connectors.
- C. Grouting under base plates.

1.02 RELATED REQUIREMENTS

- A. Section 05 3100 - Steel Decking: Support framing for small openings in deck.
- B. Section 05 5000 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual; 2023, with Errata (2026).
- B. AISC 207 - Certification Standard for Steel Fabrication and Erection, and Manufacturing of Metal Components
- C. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2022, with Errata (2025).
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- F. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished; 2024.
- G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- H. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2026.
- I. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric); 2026.
- J. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2022.
- K. ASTM E94/E94M - Standard Guide for Radiographic Examination Using Industrial Radiographic Film; 2022.
- L. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2024.
- M. ASTM E165/E165M - Standard Practice for Liquid Penetrant Testing for General Industry; 2023.
- N. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2021.
- O. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2024.
- P. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2020.
- Q. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025a.
- R. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- S. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- T. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Amendment (2026).
- U. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2020.
- V. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- W. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.
- X. SSPC-SP 3 - Power Tool Cleaning; 2024.

SECTION 05 1200 STRUCTURAL STEEL FRAMING

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate sizes, spacing, locations of structural members, openings, attachments, fasteners, profiles, and shear stud connectors.
 - 2. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- D. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.
- E. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.
- F. Fabricator's Qualification Statement.
- G. Erector's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."
- B. Structural steel members designated as architecturally-exposed structural steel (AESS) to also comply with Section 05 1213.
- C. Maintain one copy of each document on site.
- D. Fabricator: Company specializing in performing the work of this section with minimum 5 years of documented experience.
- E. Fabricator Qualifications: A qualified steel fabricator that is accredited by the American Institute of Steel Construction (AISC) Certification Program for Fabricators of Steel Buildings (BU) in accordance with AISC 207.
- F. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.
- G. Erector Qualifications: A qualified steel erector that is accredited by the American Institute of Steel Construction (AISC) Certification Program for Structural Steel Erectors (CSE) in accordance with AISC 207.
- H. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Steel Angles and Plates: ASTM A36/A36M.
- B. Steel W Shapes and Tees: ASTM A992/A992M.
- C. Rolled Steel Structural Shapes: ASTM A992/A992M.
- D. Steel Shapes, Plates, and Bars: ASTM A529/A529M high-strength, carbon-manganese structural steel, Grade 50.
- E. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade C.
- F. Pipe: ASTM A53/A53M, Grade B, Finish black.
- G. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.
- H. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563/A563M nuts and ASTM F436/F436M washers.
- I. Headed Anchor Rods: ASTM F1554 Grade 36, plain.
- J. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- K. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
 - 2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

SECTION 05 1200 STRUCTURAL STEEL FRAMING

- L. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- M. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Shop fabricate to greatest extent possible.
- B. Fabricate connections for bolt, nut, and washer connectors.
- C. Develop required camber for members.

2.03 FINISH

- A. Prepare structural component surfaces in accordance with SSPC-SP 3.
- B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.
 - 1. Apply to provide a dry film thickness of not less than 1.5 mils.
 - 2. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.04 SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts," testing at least 2 percent of bolts at each connection.
- C. Welded Connections: Visually inspect all shop-welded connections and test at least 2 percent of welds using one of the following:
 - 1. Radiographic testing performed in accordance with ASTM E94/E94M.
 - 2. Ultrasonic testing performed in accordance with ASTM E164.
 - 3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
 - 4. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

- A. Erect structural steel in compliance with AISC 303.
- B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Field weld components and shear studs indicated on shop drawings.
- D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".
- E. Do not field cut or alter structural members without approval of Architect.
- F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
- G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

SECTION 05 1200 STRUCTURAL STEEL FRAMING

- B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts," testing at least 2 percent of bolts at each connection.
- C. Welded Connections: Visually inspect all field-welded connections and test at least 2 percent of welds using one of the following:
 - 1. Radiographic testing performed in accordance with ASTM E94/E94M.
 - 2. Ultrasonic testing performed in accordance with ASTM E164.
 - 3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
 - 4. Magnetic particle inspection performed in accordance with ASTM E709.

END OF SECTION

SECTION 05 3100 STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Composite floor deck.
- B. Supplementary framing for openings up to and including 18 inches.
- C. Acoustical insulation in roof deck flutes.

1.02 RELATED REQUIREMENTS

- A. Section 05 1200 - Structural Steel Framing: Support framing for openings larger than 18 inches and shear stud connectors.

1.03 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual; 2023, with Errata (2026).
- B. AISC 207 - Certification Standard for Steel Fabrication and Erection, and Manufacturing of Metal Components
- C. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2026.
- D. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- E. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks; 2007.
- F. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
- B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.
- C. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.
- D. Certificates: Certify that products furnished meet or exceed specified requirements.
- E. Submit manufacturer's installation instructions.
- F. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.
- G. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under AISC 207.
- H. Erector's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified steel fabricator that is accredited by the American Institute of Steel Construction (AISC) Certification Program for Fabricators of Steel Buildings (BU) in accordance with AISC 207.
- B. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Cut plastic wrap to encourage ventilation.
- B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.01 STEEL DECK

- A. All Deck Types: Size and profile as indicated on drawings.
 - 1. Maximum Vertical Deflection of Floor Deck: 1/360 of span.
- B. Composite Floor Deck: Fluted steel sheet embossed to interlock with concrete:
 - 1. Ungalvanized Steel Sheet: ASTM A1008/A1008M, Designation SS.
 - a. Grade as indicated on drawings.

SECTION 05 3100 STEEL DECKING

2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
3. Structural Properties as indicated on the drawings.
4. Formed Sheet Width: 24 inch.
5. Side Joints: Lock seam.
6. End Joints: Lapped 2 inches minimum, welded.

2.02 ACCESSORY MATERIALS

- A. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- B. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.

2.03 FABRICATED DECK ACCESSORIES

- A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 22 gauge, 0.0299 inch thick sheet steel; of profile and size as indicated; finished same as deck.
- B. Roof Sump Pans: Formed sheet steel, 14 gauge, 0.0747 inch minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions prior to beginning work.

3.02 INSTALLATION

- A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.
- B. On steel supports provide minimum 1-1/2 inch bearing.
- C. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.
- D. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.
- E. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

3.03 REPAIR

- A. Deck exposed to view which has been damaged as a result of welding misalignment, erection, or misuse may be replaced as determined by the Architect. The cost will be borne by Contractor when defective deck is identified.

END OF SECTION

SECTION 05 4000 COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Formed steel stud exterior wall framing.

1.02 RELATED REQUIREMENTS

- A. Section 01 4000 - Quality Requirements: Contractor's Professional Design Services.
- B. Section 06 1000 - Rough Carpentry: Wall sheathing.
- C. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).
- B. AISI S201 - North American Standard for Cold-Formed Steel Framing - Product Data; 2017.
- C. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).
- D. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.
- E. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2025.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with work of other sections that is to be installed in or adjacent to metal framing systems, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.
- C. Product Data: Provide manufacturer's data on factory-made connectors and mechanical fasteners, showing compliance with requirements.
- D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, welds, and type and location of fasteners, and accessories or items required of related work.
 - 1. Indicate stud layout.
 - 2. Describe method for securing studs to tracks and for bolted framing connections.

1.06 QUALITY ASSURANCE

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Structural Framing:
 - 1. ClarkDietrich: www.clarkdietrich.com/#sle.
 - 2. Jaimes Industries: www.jaimesind.com/#sle.
 - 3. The Steel Network, Inc: www.SteelNetwork.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Connectors:
 - 1. Same manufacturer as metal framing.

2.02 MATERIALS

- A. Material and Product Requirements Criteria: AISI S201.

2.03 STRUCTURAL FRAMING COMPONENTS

- A. Wall Studs and Track Sections: AISI S240; c-shaped studs and u-shaped track sections in stud-matching nominal width and compatible height.

SECTION 05 4000 COLD-FORMED METAL FRAMING

1. At studs backing up masonry veneer use 18-gauge minimum.

B. Jamb Studs: AISI S240; manufactured, engineered, c-shaped with wide flanges, designed to replace conventional double-stud framing at openings.

2.04 CONNECTIONS

A. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.

2.05 MISCELLANEOUS CONNECTIONS

2.06 SHEATHING

A. Wall Sheathing: See Section 06 1000 - Rough Carpentry.

2.07 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness as indicated on drawings; finish to match framing components.

B. Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify field measurements and adjust installation as required.

3.02 INSTALLATION - GENERAL

A. Install structural members and connections in compliance with ASTM C1007.

3.03 INSTALLATION OF STUDS

A. Install wall studs plumb and level.

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.

C. Place studs at 16 inches on center; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using clip and tie method.

D. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

E. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

F. Install intermediate studs above and below openings to align with wall stud spacing.

G. Provide deflection allowance in stud track, directly below horizontal building framing at non-loadbearing framing.

H. Attach cross studs to studs for attachment of fixtures anchored to walls.

I. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

J. Touch-up field welds and damaged corrosion protected surfaces with primer.

3.04 INSTALLATION OF WALL SHEATHING

A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.

3.05 TOLERANCES

A. Maximum Variation from True Position: 1/4 inch.

B. Maximum Variation of any Member from Plane: 1/8 inch.

END OF SECTION

SECTION 05 5000 METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel items.

1.02 RELATED REQUIREMENTS

- A. Section 01 4000 - Quality Requirements: Contractor's Professional Design Services.
- B. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.
- C. Section 05 5100 - Metal Stairs.
- D. Section 05 5133 - Metal Ladders.
- E. Section 05 5213 - Pipe and Tube Railings.

1.03 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual; 2023, with Errata (2026).
- B. AISC 207 - Standard for Certification Programs; 2025.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.
- G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- H. ASTM A576 - Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality; 2023.
- I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- J. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.
- K. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2026.
- L. 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; 2025.
- M. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- N. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025a.
- O. ASTM F 1043 - Fence Pipe
- P. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- Q. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- R. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Amendment (2026).
- S. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- T. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.
- U. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

SECTION 05 5000 METAL FABRICATIONS

- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.
- D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 207.

1.05 QUALITY ASSURANCE

- A. Design shop drawings under direct supervision of a Professional Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Fabricator Qualifications:
 - 1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 207.
- C. Fabricator Qualifications: A qualified steel fabricator that is accredited by the American Institute of Steel Construction (AISC) Certification Program for Fabricators of Steel Buildings (BU) in accordance with AISC 207.
- D. Verify that field measurements are as indicated on shop drawings.
- E. All metal items affecting safety of persons shall comply with requirements of Part 1910 of the Federal Occupational Safety and Health Regulations.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A 53/A 53M Grade B Schedule 40, black finish.
- E. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.
- F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

- A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; Galvanized finish at exterior and primed finish at interior.
- B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of masonry; galvanized finish.
- C. Lintels: As detailed; galvanized finish.

SECTION 05 5000 METAL FABRICATIONS

- D. Door Frames for Overhead Door Openings: Channel sections; galvanized finish.
- E. Slotted Channel Framing: Fabricate channels and fittings from structural steel complying with the referenced standards; factory-applied, rust-inhibiting thermoset acrylic enamel finish.
 - 1. Manufacturers:
 - a. Unistrut Corp: www.unistrut.com
 - b. Flex-Strut, Inc.: www.flexstrut.com
 - c. Substitutions: See Section 01 6000 - Product Requirements.
 - 2. Channel:
 - a. Roll-formed steel into channel configurations.
 - b. Material:
 - 1) Cold Rolled: ASTM A1008/A1008M
 - 2) Hot-Rolled: ASTM A1011/A1011M
 - 3) Physical Requirements of: ASTM A653/A653M, Grade 33.
 - c. Design: AISI - Specification for the Design of Cold-Formed Steel Structural Member.
 - d. Finishes:
 - 1) Thermoset acrylic enamel paint applied by electro-deposition, thoroughly baked.
 - 2) Color: Selected by architect from manufacturers standard.
 - 3. Channel Nuts:
 - a. Case hardened. Conform to ASTM A575 or ASTM A576.
 - b. Finish: Electro-galvanized zinc per ASTM B633.
 - 4. Fittings:
 - a. Cold formed for specific channel connection application. Conform to ASTM A569 or ASTM A575.
 - b. Finish:
 - 1) Polyester powder coat, thoroughly baked.
 - 2) Color: Selected by architect from manufacturers standard.

2.04 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items to be embedded in concrete and items to be embedded in masonry.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.
- E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.05 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

SECTION 05 5000 METAL FABRICATIONS

- C. Field weld components as indicated on drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.
- G. Obtain Architect/Engineer approval prior to site cutting or making adjustments not scheduled.
- H. Touch Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- I. For Galvanized Surfaces: Clean field welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780/A780M.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 5100 METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Stairs with grating treads.
- B. Structural steel stair framing and supports.
- C. Handrails and guards.

1.02 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- H. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025a.
- I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- J. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Amendment (2026).
- L. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- N. NAAMM AMP 510 - Metal Stairs Manual; 1992.
- O. NAAMM MBG 531 - Metal Bar Grating Manual; 2024.
- P. NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual; 2024.
- Q. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- R. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.
- S. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Include the design engineer's seal and signature on each sheet of shop drawings.
- C. Design Data: As required by authorities having jurisdiction.
- D. Design Data, Seismic Performance: Submit documentation that stairs meet performance requirements specified.
- E. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

SECTION 05 5100 METAL STAIRS

1.04 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.
- B. Fabricator Qualifications:
 - 1. A company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

- A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
 - 1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
 - 2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
 - 3. Structural Design: Provide complete stair and railing assemblies that comply with the applicable local code.
 - 4. Dimensions: As indicated on drawings.
 - 5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
 - 6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
 - 7. Separate dissimilar metals using paint or permanent tape.
- B. Metal Jointing and Finish Quality Levels:
 - 1. Industrial: All joints made neatly.
 - a. Welded Joints: Welded on back side wherever possible.
 - b. Welds Exposed to Touch: Ground smooth.
 - c. Bolts Exposed to Touch in Travel Area: No nuts or screw threads exposed to touch.
- C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH GRATING TREADS

- A. Jointing and Finish Quality Level: Industrial, as defined above.
- B. Risers: Closed.
- C. Treads: Steel bar grating.
 - 1. Grating Type: Welded.
 - 2. Bearing Bar Depth: 3/4 inch, minimum.
 - 3. Top Surface: Standard.
 - 4. Nosing: Checkered plate.
 - 5. Nosing Width: 1-1/4 inch, minimum.
 - 6. Anchorage to Stringers: End plates welded to grating, bolted to stringers.
- D. Stringers: Rolled steel channels.
 - 1. Stringer Depth: As indicated on drawings.
 - 2. End Closure: Sheet steel, 14 gauge, 0.075 inch minimum; welded across ends.
- E. Railings: Steel pipe railings.
- F. Finish: Shop- or factory-prime painted.

2.03 HANDRAILS AND GUARDS

- A. Post-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
 - 1. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.
- B. Guards:
 - 1. Top Rails: Round pipe or tube rails unless otherwise indicated.
 - a. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.

SECTION 05 5100 METAL STAIRS

2. Infill at Pipe Railings: Pipe or tube rails sloped parallel to stair.
 - a. Outside Diameter: 1-1/2 inch.
 - b. Material: Steel pipe or tube, round.
 - c. Vertical Spacing: Maximum 4 inches on center.
 - d. Jointing: Welded and ground smooth and flush.
3. End and Intermediate Posts: Same material and size as top rails.
 - a. Horizontal Spacing: As indicated on drawings.
 - b. Mounting: Welded to top surface of stringer.

2.04 MATERIALS

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.
- C. Pipe: ASTM A53/A53M Grade B Schedule 40, galvanized finish.
- D. Gratings: Bar gratings that comply with NAAMM MBG 531 or NAAMM MBG 532, whichever applies based on bar sizes.

2.05 ACCESSORIES

- A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.
- B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- C. Shop and Touch-Up Primer: SSPC-Paint 15, and comply with VOC limitations of authorities having jurisdiction.
- D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, and comply with VOC limitations of authorities having jurisdiction.

2.06 SHOP FINISHING

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Prime Painting: Use specified shop- and touch-up primer.
 1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
 2. Number of Coats: One.
- D. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A123/A123M.
 1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. When field welding is required, clean and strip primed steel items to bare metal.

3.03 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.
- C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Provide welded field joints where specifically indicated on shop drawings. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.
- F. Obtain approval prior to site cutting or creating adjustments not scheduled.
- G. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

SECTION 05 5100 METAL STAIRS

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 05 5213 PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Stair railings and guardrails.
- B. Free-standing railings at steps.

1.02 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.
- D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.
- E. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2024.
- F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- G. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Amendment (2026).
- I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- J. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Include the design engineer's seal and signature on each sheet of shop drawings.
- C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.
- D. Fabricator's Qualification Statement.

1.04 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.
- B. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.
- C. Fabricator Qualifications:
 - 1. A company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.
- B. Allow for expansion and contraction of members and building movement without damage to connections or members.
- C. Dimensions: See drawings for configurations and heights.
 - 1. Top Rails and Wall Rails: 1-1/2 inches diameter, round.
 - 2. Intermediate Rails: 1-1/2 inches diameter, round.
 - 3. Posts: 1-1/2 inches diameter, round.

SECTION 05 5213 PIPE AND TUBE RAILINGS

- D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
- E. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

- A. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- B. Galvanizing: In accordance with requirements of ASTM A123/A123M.
 - 1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.
- C. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured.
- D. Welded Joints:
 - 1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 - 2. Interior Components: Continuously seal joined pieces by continuous welds.
 - 3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Weld connections that cannot be shop welded due to size limitations.
 - 1. Weld in accordance with AWS D1.1/D1.1M.
 - 2. Match shop welding and bolting.
 - 3. Clean welds, bolted connections, and abraded areas.
 - 4. Touch up shop primer and factory-applied finishes.
 - 5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D. Anchor railings securely to structure.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06 1000 ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonstructural dimension lumber framing.
- B. Preservative treated wood materials.
- C. Fire retardant treated wood materials.
- D. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

- A. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2024).
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- D. AWPA M4 - Standard for the Handling, Storage, Field Fabrication and Field Treatment of Preservative-Treated Wood Products; 2023.
- E. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.
- F. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. PS 1 - Structural Plywood; 2023.
- H. PS 20 - American Softwood Lumber Standard; 2025.
- I. WWP A G-5 - Western Lumber Grading Rules; 2025.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit technical data on wood treatment.
- C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for materials and workmanship commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
 - 3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

SECTION 06 1000 ROUGH CARPENTRY

- B. Lumber fabricated from recovered timber is permitted in lieu of sustainably harvested lumber, unless otherwise noted, provided it meets the specified requirements for new lumber and is free of contamination; identify source.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Western Wood Products Association; WWPA G-5.
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Stud Framing (2 by 2 through 2 by 6):
 - 1. Grade: No. 2.
- E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.03 ACCESSORIES

- A. Metal and Finish of Fasteners:
 - 1. Fire-Retardant-Treated Wood:
 - a. Nails, timber rivets, wood screws, and lag screws: Hot-dip galvanized steel complying with ASTM A153/A153M Class D.
 - 2. Preservative-Treated Wood:
 - a. Nails, timber rivets, wood screws, and lag screws - general use: Hot-dip galvanized steel complying with ASTM A153/A153M Class D.
 - 3. Untreated Wood: Unfinished steel.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- F. Provide nonstructural framing and blocking to support the following:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Chalkboards and marker boards.
 - 8. Wall paneling and trim.
 - 9. Joints of rigid wall coverings that occur between studs.
 - 10. Other wall- or ceiling-mounted items indicated on drawings.

SECTION 06 1000 ROUGH CARPENTRY

3.03 CLEANING

- A. Waste Disposal: See Section 01 7419 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

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SECTION 06 2000 FINISH CARPENTRY

PART 2 PRODUCTS

1.01 FINISH CARPENTRY ITEMS

1.02 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting.
Provide trim for scribing and site cutting.

END OF SECTION

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SECTION 07 9200 JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

1.03 REFERENCE STANDARDS

- A. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).
- B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2024.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.
- E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.
- F. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Backing material recommended by sealant manufacturer.
 - 4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 5. Substrates the product should not be used on.
 - 6. Substrates for which use of primer is required.
- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Manufacturer's qualification statement.
- F. Installer's qualification statement.
- G. Executed warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5 year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.
- C. Extended Correction Period: Correct defective work within 5 year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Nonsag Sealants:
 - 1. Adfast USA Inc: www.adfastcorp.com/#sle.

SECTION 07 9200 JOINT SEALANTS

2. Bostik Inc: www.bostik-us.com/#sle.
3. Dow: www.dow.com/#sle.
4. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
5. Sika Corporation: usa.sika.com/#sle.
6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
7. W. R. Meadows, Inc: www.wrmeadows.com/#sle.
8. Substitutions: See Section 01 6000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

- A. Scope:
1. Exterior Joints:
 - a. Seal the following joints:
 - 1) Wall expansion and control joints.
 - 2) Joints between doors, windows, and other frames or adjacent construction.
 - 3) Joints between different exposed materials.
 2. Interior Joints:
 - a. Do not seal gaps and openings in suspended ceilings
 - b. Seal the following joints:
 - 1) Joints between door frames and window frames and adjacent construction.
 - 2) In sound-rated wall and ceiling assemblies, seal joints between wall assemblies and ceiling assemblies; between wall assemblies and other construction; between ceiling assemblies and other construction.
 3. Do Not Seal:
 - a. Intentional weep holes in masonry.
 - b. Joints indicated to be covered with expansion joint cover assemblies.
 - c. Joints where sealant installation is specified in other sections.
 - d. Joints between suspended ceilings and walls.
- B. Exterior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.
- C. Interior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.
- D. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

2.03 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

2.04 NONSAG JOINT SEALANTS

- A. Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M, A, G, and O; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
 2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 4. Color: To be selected by Architect from manufacturer's full range.
- B. Silicone Sealant: ASTM C920, Grade NS, Uses M, A, G, and O; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
 2. Color: To be selected by Architect from manufacturer's standard range.

2.05 SELF-LEVELING JOINT SEALANTS

- A. High Quality Latex-Based Sound Sealant: ASTM C834, Type OP an opaque sealant, and Grade 0, 32 degrees F, meets requirements for low-temperature flexibility.
1. Color: Selected by Architect from Manufacturers full range..

2.06 ACCESSORIES

- A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.

SECTION 07 9200 JOINT SEALANTS

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Install acoustical sealant application work in accordance with ASTM C919.
- D. Install bond breaker backing tape where backer rod cannot be used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

3.05 POST-OCCUPANCY

- A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width, i.e., at low temperature in thermal cycle. Report failures immediately and repair them.

END OF SECTION

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SECTION 08 0671 DOOR HARDWARE SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preliminary schedule of door hardware sets for swinging and Overhead as indicated on drawings.

1.02 RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware: Requirements to comply with in coordination with this section.

1.03 REFERENCE STANDARDS

- A. BHMA (CPD) - Certified Products Directory; Current Edition.
- B. BHMA A156.3 - Exit Devices; 2025.
- C. BHMA A156.5 - Cylinders and Input Devices for Locks; 2020.
- D. BHMA A156.13 - Mortise Locks and Latches; 2022.
- E. BHMA A156.18 - Standard for Materials and Finishes; 2020.
- F. DHI (H&S) - Sequence and Format for the Hardware Schedule; 2019.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Comply with submittal requirements as indicated in Section 08 7100.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Only manufacturers listed in Door Hardware Schedule or Section 08 7100 are considered acceptable, unless noted otherwise.
- B. Manufacturer's Abbreviations: Coordinate with manufacturers listed in Section 08 7100.

2.02 DESCRIPTION

- A. Door hardware sets provided represent the design intent, they are only a guideline and should not be considered a detailed or complete hardware schedule.
 - 1. Provide door hardware item(s) as required for similar purposes, even when item is not listed for a door in Door Hardware Schedule.
 - 2. Necessary items that are not included in a Hardware Set should be added and have the appropriate additional hardware as required for proper application and functionality.
 - 3. Door hardware supplier is responsible for providing proper size and hand of door for products required in accordance with Door Hardware Schedule and as indicated on drawings.
 - 4. Quantities listed are for each Pair (PR) of doors, or for each Single (SGL) door, as indicated in hardware sets.

2.03 LOCK FUNCTION CODES

- A. Function Codes for Cylindrical Locks: Complying with BHMA A156.5.
- B. Function Codes for Mortise Locks: Complying with BHMA A156.13.
- C. Function Codes for Exit Devices: Complying with BHMA A156.3.

2.04 FINISHES

- A. Finishes: Complying with BHMA A156.18.

PART 3 EXECUTION

3.01 DOOR HARDWARE SCHEDULE

- A. Organize listing of door hardware components within each hardware set in compliance with 10-Part scheduling sequence indicated in DHI (H&S), unless otherwise indicated.

3.02 HARDWARE SET # 01: "STORAGE LOCKSET"

- A. For use on Door Number(s): 2004, 2007 - Existing reinstalled from E0.1.61/2101A, 2012.
- B. Provide for each Single (SGL) door(s).

UNITS	ITEM	DESCRIPTION	FINISH	MFR
3 EA	HINGE	MPB91 4.5 X 4.5	US32D	MCKINNEY
1 EA	OFFICE/ENTRY LOCK	AU 4707LN LC	626	YALE
1 EA	CYLINDER SLEEVE	14-5305-9078-999		YALE

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1 EA	CYLINDER	20-0503 J P	26	MEDECO
1 EA	SURFACE CLOSER	210 TPN	689	NORTON
1 EA	WALL STOP	409	US32D	ROCKWOOD
1 EA	KICK PLATE	K1050 8" X 34"	US32D	ROCKWOOD
3 Each	SILENCER	608-RKW	GRY	ROCKWOOD

3.03 HARDWARE SET # 02: "INTERIOR DOOR INTO FITNESS"

- A. For use on Door Number(s): 2009.
- B. Provide for each Single (SGL) door(s).

UNITS	ITEM	DESCRIPTION	FINISH	MFR
1 EA	ELECTRIC HINGE	TA2314-QC4 4.5 x 4.5	US32D	MCKINNEY
2 EA	HINGE	MPB891 4.5 X 4.5	US32D	MCKINNEY
1EA	ELECTRIFIED CYLINDRICAL LOCK	AU 4791LN LC 24VDC FAIL SECURE	626	YALE
1EA	CYLINDER SLEEVE	14-5305-9078-999		YALE
1EA	CYLINDER	20-0503 J P	26	MEDECO
1 EA	POSITION SWITCH	DPS-M-GY		SECURITRON
1 EA	REQUEST TO EXIT	XMS		SECURITRON
1EA	SURFACE CLOSER - HEAVY DUTY, NON- HOLD OPEN WITH REMOVABLE STOP	210 HDN	689	NORTON
1 EA	KICK PLATE	K1050 8" X 34"	US32D	ROCKWOOD
1 EA	POWER SUPPLY	AL175UL		ALTRONIX
3 EA	SILENCER	608-RKW	GRY	ROCKWOOD

- C. Door may be locked or unlocked with a key, free egress at all times, self closing. GC shall install this card reader only because it is removed from the existing stairwell door and relocated here.

3.04 HARDWARE SET # 03: "OFFICE LOCKSET"

- A. For use on Door Number(s): 2010, 3108B, 3108C, 3123, 3121 - Existing hardware from SS.1.17/3123 reinstalled.
- B. Provide for each Single (SGL) door(s).

UNITS	ITEM	DESCRIPTION	FINISH	MFR
3 EA	HINGE	MPB91 4.5 X 4.5	US32D	MCKINNEY
1 EA	OFFICE/ENTRY LOCK	AU 4707 LN LC	626	YALE
1 EA	CYLINDER SLEEVE	14-5305-9078-999		YALE
1 EA	CYLINDER	20-0503 J P	26	MEDECO
1 EA	WALL STOP	409	US32D	ROCKWOOD
3 EA	SILENCER	608-RKW	GRY	ROCKWOOD
1 EA	KICKPLATE	K1050 8 X 34	US32D	ROCKWOOD

3.05 HARDWARE SET # 04: "CONFERENCE, TRAINING, COMPUTER ROOMS"

- A. For use on Door Number(s): 2001 - EXISTING HARDWARE FROM E0.1.32/2105 REINSTALLED, 2002 - EXISTING HARDWARE REINSTALLED FROM E0.1.34/2104, 2003, 2008, 2275A, 2275B.
- B. Provide for each Single (SGL) door(s).

UNITS	ITEM	DESCRIPTION	FINISH	MFR
3 EA	HINGE	MPB91 4.5 X 4.5	US32D	MCKINNEY
1 EA	PASSAGE SET	AU 4701LN	626	YALE
1 EA	WALL STOP	409	US32D	ROCKWOOD
3 EA	SILENCER	608-RKW	GRY	ROCKWOOD

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1 EA	KICKPLATE	K1050 8 X 34	US32D	ROCKWOOD
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3.06 HARDWARE SET # 05: "TRAINING ROOM STORAGE UN EVEN PAIR"

- A. For use on Door Number(s): 2136.
- B. Provide for each Pair (PR) door(s).

UNITS	ITEM	DESCRIPTION	FINISH	MFR
6 EA	HINGE	MPB91 4.5 X 4.5	US32D	MCKINNEY
1 EA	OFFICE/ENTRY LOCK	AU 4707LN LC	626	YALE
1 EA	CYLINDER SLEEVE	14-5305-9078-999		YALE
1 EA	CYLINDER	20-0503 J P	26	MEDECO
1 EA	WALL STOP	409	US32D	ROCKWOOD
1 EA	KICKPLATE	K1050 8 X 32	US32D	ROCKWOOD
3EA	SILENCER	608-RKW	GRY	ROCKWOOD
1 EA	FLUSH BOLT		US32D	MCKINNEY

3.07 HARDWARE SET # 06: "FITNESS & SHOP TO EXTERIOR WITH CARD READER"

- A. For use on Door Number(s): 2013, 3107.
- B. Provide for each Single (SGL) door(s).

UNITS	ITEM	DESCRIPTION	FINISH	MFR
1 EA	ELECTRIC HINGE	TA2314-QC 4.5 X 4.5	US32D	MCKINNEY
2EA	HINGE	MPB91XNRP 4.5 X 4.5	US32D	MCKINNEY
1 EA	RIM EXIT DEVICE	6100 EO	630	YALE
1 EA	ELECTRIC RIM EXIT	6100 B P EO	630	YALE
1 EA	MORTISE CYLINDER & SLEEVE	100200 J P CT-Z20	26	MEDECO
1 EA	DOOR PULL	107	US32D	ROCKWOOD
1 EA	SURFACE CLOSER	210 TPN	689	NORTON
1 EA	KICKPLATE	K1050 8 X 34	US32D	ROCKWOOD
1 EA	THRESHOLD	171A X 36	SN	PEMCO
1 EA	GASKETING	303AV X 36X 84	C	PEMCO
1 EA	SWEEP	307AV X 36	C	PEMCO
1 EA	POSITION SWITCH	DPS-M-GY		SECURITRON
1 EA	POWER SUPPLY	782		YALE

3.08 HARDWARE SET # 07: "ELECTRIC OVERHEAD DOORS"

- A. For use on Door Number(s): 3107 OH1, 3107 OH2.
- B. Provide for each Single (SGL) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
1 EA	PER MANUFACTURER	LOCK - PER MANUFACTURER	MATCH EXISTING		OVERHEAD DOOR
1 Each	PER MANUFACTURER	HANDLE	MATCH EXISTING		OVERHEAD DOOR
2 EA	PER MANUFACTURER	VERICAL TRACKS	FULL - MATCH EXISTING		OVERHEAD DOOR
1 EA	PER MANUFACTURER	HEAVY DUTY DOOR SAFETY EDGE	MATCH EXISTING		OVERHEAD DOOR

3.09 HARDWARE SET # 08: "[MEN'S LOCKER ROOM - EXISTING REINSTALLED]"

- A. A. For use on Door Number(s): 2011 (remove from existing 2011 and reinstall at new 2011)
- B. Provide for each single door

SECTION 08 0671 DOOR HARDWARE SCHEDULE

UNITS	ITEM	DESCRIPTION	FINISH	MFR
3 EA	HINGE	EX	EX	EX
1 EA	PUSH PLATE	EX	EX	EX
1 EA	PULL PLATE	EX	EX	EX
1 EA	SURFACE CLOSER	EX	EX	EX
1 EA	KCIK PLATE	EX	EX	EX
1 EA	WALL STOP	EX	EX	EX
3 EA	SILENCER	EX	EX	EX

3.10 HARDWARE SET # 09: "[FACILITIES SHOPS INTERIOR DOORS J]"

A. FOR USE ON DOOR NUMBER(S): [3107A, 3108A]

B. PROVIDE FOR EACH SINGLE DOOR

UNITS	ITEM	DESCRIPTION	FINISH	MFR
3 EA	HINGE	MPB91 4.5 X 4.5	US32D	MCKINNEY
1 EA	OFFICE/ENTRY LOCK	AU 4707LN LC	626	YALE
1 EA	CYLINDER SLEEVE	14-5305-9078-999		YALE
1 EA	CYLINDER	20-0503 J P	26	MEDECO
1 EA	SURFACE OVERHEAD HOLDER/STOP	9-336	652	RIXON
3 EA	SILENCER	608-RKW	GRY	ROCKWOOD
1 EA	KICKPLATE	K1050 8 X 34	US32D	ROCKWOOD
1 EA	SMOKE SEAL	MATCH EXISTING ADJACENT		ASSA ABBLOY OR EQUAL

END OF SECTION

SECTION 08 1113 HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Thermally insulated hollow metal doors with frames.
- D. Sound-rated hollow metal doors and frames.
- E. Hollow metal borrowed lites glazing frames.
- F. Accessories, including glazing, louvers, and matching panels.

1.02 RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware.
- B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2026.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2025.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2026.
- G. 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; 2025.
- H. ASTM C143/C143M - Standard Test Method for Slump of Concrete; 2026a.
- I. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- J. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.
- K. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- L. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- M. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2024.
- N. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2024.
- O. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
- P. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025, with Amendment (2024).
- Q. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

SECTION 08 1113 HOLLOW METAL DOORS AND FRAMES

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

B. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:

1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
3. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
4. Steelcraft, an Allegion brand: www.allegion.com/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:

1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
4. Door Edge Profile: Manufacturers standard for application indicated.
5. Typical Door Face Sheets: Flush.
6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvanized) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
 - a. Based on SDI Standards: Provide at least A40/ZF120 (galvanized) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvanized) for corrosive locations.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Exterior Doors: Thermally insulated.

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
2. Door Thickness: 1-3/4 inches, nominal.

SECTION 08 1113 HOLLOW METAL DOORS AND FRAMES

- B. Interior Doors, Non-Fire-Rated:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
 - 2. Door Thickness: 1-3/4 inches, nominal.
 - 3. Door Finish: Factory primed and field finished.
- C. Sound-Rated Interior Doors:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
 - 2. Door Thickness: As required to meet acoustic requirements indicated.
 - 3. Opening Force of Sound-Rated Doors, Non-Fire-Rated: 5 pounds, maximum, in compliance with ADA Standards.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Exterior Door Frames: Full profile/continuously welded type.
 - 1. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
 - 2. Weatherstripping: Separate, see Section 08 7100.
- C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 - 1. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
- D. Sound-Rated Door Frames: Full profile/continuously welded type.
 - 1. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
- E. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
- F. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

2.05 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

- A. Glazing: As specified in Section 08 8000, factory installed.
- B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- C. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
- D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.
- F. Contractor to provide conduit/raceway for low voltage connections to electric hardware within door/frame assembly - coordinate with owner vendor.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

SECTION 08 1113 HOLLOW METAL DOORS AND FRAMES

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- E. Install door hardware as specified in Section 08 7100.
- F. Comply with glazing installation requirements of Section 08 8000.
- G. Coordinate installation of electrical connections to electrical hardware items.
- H. Touch up damaged factory finishes.

3.04 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- B. Adjust sound control doors so that seals are fully engaged when door is closed.
- C. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

3.06 SCHEDULE

- A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 1416 FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flush wood doors; flush and flush glazed configuration; non-rated.

1.02 RELATED REQUIREMENTS

- A. Section 08 1113 - Hollow Metal Doors and Frames.
- B. Section 08 7100 - Door Hardware.
- C. Section 08 8000 - Glazing .
- D. Section 09 2116 - Gypsum Board Assemblies: Bullet-resistant sheathing and wallboard for bullet-resistant partitions and walls.
- E. Section 09 9123 - Interior Painting: Field finishing of doors.

1.03 REFERENCE STANDARDS

- A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).
- B. ANSI A208.1 - American National Standard for Particleboard; 2022.
- C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2026.
- D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.
- G. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2023.
- H. AWI (QCP) - Quality Certification Program; Current Edition.
- I. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- J. AWMAC (GIS) - Guarantee and Inspection Services Program; Current Edition.
- K. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- L. BHMA A156.13 - Mortise Locks and Latches; 2022.
- M. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. NAAMM HMMA 805 - Recommended Selection and Usage Guide for Hollow Metal Doors and Frames; 2012.
- O. NAAMM HMMA 866 - Guide Specifications for Stainless Steel Hollow Metal Doors and Frames; 2012 (Reapproved 2018).
- P. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025, with Amendment (2024).
- Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.
- R. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- S. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- T. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).
- U. WI (CCP) - Certified Compliance Program (CCP); Current Edition.
- V. WI (CSIP) - Certified Seismic Installation Program (CSIP); Current Edition.
- W. WI (MCP) - Monitored Compliance Program (MCP); Current Edition.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

SECTION 08 1416 FLUSH WOOD DOORS

- C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
- D. Samples: Submit two samples of door veneer, 6 by 8 inches in size illustrating wood grain, stain color, and sheen.
- E. Manufacturer's qualification statement.
- F. Installer's qualification statement.
- G. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

- A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging, and inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.
 - 1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Match manufacturer from existing doors found in adjacent spaces of building.

2.02 DOORS AND PANELS

- A. Doors: See drawings for locations and additional requirements.
 - 1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at each location.

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

2.04 DOOR FACINGS

2.05 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
 - 1. Provide solid blocks at lock edge for hardware reinforcement.
 - 2. Provide solid blocking for other throughbolted hardware.
- C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- F. Provide edge clearances in accordance with the quality standard specified.

SECTION 08 1416 FLUSH WOOD DOORS

2.06 FINISHES - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Match finish, stain, and sheen of existing doors found in adjacent spaces of the building.

2.07 ACCESSORIES

- A. Hollow Metal Door Frames: See Section 08 1113.
- B. Glazed Openings:
 - 1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
 - 2. Glazing: Single vision units, 1/4 inch thick glass.
- C. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
 - 1. Install exterior doors in accordance with ASTM E2112.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.

3.03 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

3.05 SCHEDULE

- A. See Door and Frame Schedule appended to this section.

END OF SECTION

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SECTION 08 3323 OVERHEAD COILING DOORS - CHI OVERHEAD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Coiling doors.

1.02 RELATED REQUIREMENTS

- A. Section 26 0583 - Wiring Connections.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit electrical equipment, general construction, and performance characteristics.
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Manufacturer's Instructions: Indicate installation sequence and procedures.
- E. Manufacturer's qualification statement.
- F. Installer's qualification statement.
- G. Operation and Maintenance Data: Indicate requirements for lubrication and frequency and periodic adjustments.
- H. Specimen warranty.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of type specified, with minimum 3 years of documented experience.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for roller shaft counterbalance assembly. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Overhead Door: www.overheaddoor.com

2.02 COILING DOORS

- A. Non-Rated Doors: Steel slat curtain.
 - 1. Capable of withstanding positive and negative wind loads of 20 psf without undue deflection or damage to components. Comply with ASTM E330/E330M.
 - 2. Products: Overhead Door; Series 592.
 - 3. Bottom Bar: Steel angles bolted together, primed black finish.
 - 4. Guide: Steel angles bolted together, primed black finish.
 - 5. Hood Enclosure: Manufacturer's standard; primed steel.
 - 6. Manual operation.
 - 7. Electric operation.
 - 8. Mounting: Within framed opening.
 - 9. Locking Devices: Lock and latch handle on outside.

2.03 MATERIALS

- A. Metal Curtain Construction: Interlocking slats.
 - 1. Slat Ends: Each slat fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
 - 2. Curtain Bottom for Slat Curtains: Fitted with angles to provide reinforcement and positive contact in closed position.
 - 3. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure.

SECTION 08 3323 OVERHEAD COILING DOORS - CHI OVERHEAD DOORS

- B. Guides: Steel angles in accordance with ASTM A36/A36M.
- C. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
- D. Lock Hardware:
- E. Barrel Assembly: Steel pipe and steel helical spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adjacent construction meets manufacturer's requirements for door installation.
- B. Verify electrical services are installed and accessible.
- C. Verify door opening is plumb, header is level, and dimensions are correct.
- D. Notify Architect of unacceptable conditions or varying dimensions.
- E. Commencement of installation indicates acceptance of substrate and door opening conditions.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly, including hardware, level and plumb to provide smooth operation.

3.03 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation from Plumb: 1/16 inch.
- C. Maximum Variation from Level: 1/16 inch.

3.04 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Clean installed components.
- C. Remove labels and visible markings.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals for additional submittals.
- B. Demonstrate operation of coiling doors to Owner's designated representative.

3.07 PROTECTION

- A. Protect installed coiling doors from subsequent construction operations.

3.08 MAINTENANCE

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

END OF SECTION

SECTION 08 7100 DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for wood and hollow metal doors.
- B. Electrically operated and controlled hardware.
- C. Thresholds.
- D. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

- A. Section 08 0671 - Door Hardware Schedule: Schedule of door hardware sets.
- B. Section 08 1113 - Hollow Metal Doors and Frames.
- C. Section 08 1416 - Flush Wood Doors.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. BHMA A156.1 - Standard for Butts and Hinges; 2025.
- C. BHMA A156.2 - Bored and Preassembled Locks and Latches; 2022.
- D. BHMA A156.3 - Exit Devices; 2025.
- E. BHMA A156.4 - Door Closers and Pivots; 2024.
- F. BHMA A156.5 - Cylinders and Input Devices for Locks; 2020.
- G. BHMA A156.7 - Template Hinge Dimensions; 2022.
- H. BHMA A156.8 - Door Controls - Overhead Stops and Holders; 2021.
- I. BHMA A156.13 - Mortise Locks and Latches; 2022.
- J. BHMA A156.16 - Standard for Auxiliary Hardware; 2023.
- K. BHMA A156.21 - Thresholds; 2025.
- L. BHMA A156.22 - Standard for Gasketing; 2021.
- M. BHMA A156.25 - Electrified Locking Devices; 2023.
- N. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.
- O. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.
- P. DHI (H&S) - Sequence and Format for the Hardware Schedule; 2019.
- Q. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- R. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- S. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- T. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; attendance is required by affected installers and the following:
 - 1. Architect.
 - 2. Installer's Architectural Hardware Consultant (AHC).
 - 3. Hardware Installer.
 - 4. Owner's Security Consultant.
 - 5. Owner.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.

SECTION 08 7100 DOOR HARDWARE

- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
 - 1. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
 - 2. List groups and suffixes in proper sequence.
 - 3. Provide complete description for each door listed.
 - 4. Provide manufacturer name, product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
 - 5. Include account of abbreviations and symbols used in schedule.
- D. Shop Drawings - Electrified Door Hardware: Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
 - 1. Elevations: Submit front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
 - 2. Diagrams: Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- F. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
 - 1. Submit manufacturer's parts lists and templates.
- G. Keying Schedule:
 - 1. Submit PDF copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.
- H. Manufacturer's qualification statement.
- I. Installer's qualification statement.
- J. Specimen warranty.
- K. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
- L. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Lock Cylinders: Ten for each master keyed group.
 - 3. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.
 - 1. Closers: Five years, minimum.

SECTION 08 7100 DOOR HARDWARE

2. Exit Devices: Three years, minimum.
3. Locksets and Cylinders: Three years, minimum.
4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Provide door hardware products that comply with the following requirements:
 1. Applicable provisions of federal, state, and local codes.
 2. Accessibility: ADA Standards and ICC A117.1.
 3. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
 4. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
 5. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.
- D. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.
 1. See Section 28 1000 for additional access control system requirements.
- E. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. See Door Hardware Schedule.

2.02 HINGES

- A. Manufacturers:
 1. McKinney; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Hinges: Comply with BHMA A156.1, Grade 1.
 1. Interior Door Hinges Type: Mckinney MPB91 MacPro Full Mortise 5 Knuckle Butt Hinge 32D630
 2. Exterior Door Hinges Type: Mckinney MPB91NRP MacPro Full Mortise 5 Knuckle Butt Hinge 32D630.
 3. Exterior Electric Door Hinge Type: Mckinney TA2314-QC4
 - a. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
 - 1) Provide hinge width required to clear surrounding trim.
 - b. Provide hinges on every swinging door.
 - c. Provide following quantity of butt hinges for each door:
 - 1) Doors From 60 inches High up to 90 inches High: Three hinges.

2.03 FLUSH BOLTS

- A. Manufacturers:
 1. Adams Rite or McKinney, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Manual Flush Bolts: Comply with BHMA A156.16, Grade 1.
 1. Flush Bolt Throw: 3/4 inch, minimum.
 2. Provides extension bolts in leading edge of door, one bolt into floor, one bolt into top of frame.
 - a. Pairs of Swing Doors: At inactive leaves, provide flush bolts of type as required to comply with code.

2.04 EXIT DEVICES

- A. Manufacturers:
 1. Yale; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Exit Devices: Comply with BHMA A156.3, Grade 1.
 1. Exit Device Type: Yale 6100EO & 6100BPEO

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2. Exit Device Finish: 630
 - a. Lever design to match lockset trim.
 - b. Provide cylinder with cylinder dogging or locking trim.
 - c. Provide exit devices properly sized for door width and height.
 - d. Provide strike as recommended by manufacturer for application indicated.
 - e. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.
 - f. For electrical options, provide quick connect plug-in pre-wired connectors.

2.05 LOCK CYLINDERS

- A. Manufacturers:
 1. Medeco: www.medeco.com.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
 1. Provide standard and electronic type cylinders, Grade 1, with six-pin core in compliance with BHMA A156.5 at locations indicated.
 2. Provide cams and/or tailpieces as required for locking devices.

2.06 CYLINDRICAL LOCKS

- A. Manufacturers:
 1. Yale; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
 1. Cylinder Sleeve Type: Yale 14-5305-9078-999
 2. Cylinder Lock Type: Yale AU 4707LN LC
 - a. Finish: 626
 3. Electrified Cylindrical Lock Type: Yale AU 4791LN LC 24VDC
 - a. Finish: 626
 4. Bored Hole: 2-1/8 inch diameter.
 5. Latchbolt Throw: 1/2 inch, minimum.
 6. Backset: 2-3/4 inch unless otherwise indicated.
 7. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
 - a. Finish: To match lock or latch.
 8. Provide a lock for each door, unless otherwise indicated that lock is not required.
 9. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.

2.07 MORTISE LOCKS

- A. Manufacturers:
 1. Yale; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Mortise Locks: Comply with BHMA A156.13, Grade 1.
 1. Mortise Lock Type: Yale AUR8809FL LC
 2. Latchbolt Throw: 3/4 inch, minimum.
 3. Deadbolt Throw: 1 inch, minimum.
 4. Backset: 2-3/4 inch unless otherwise indicated.
 5. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
 - a. Finish: To match lock or latch.

2.08 CLOSERS

- A. Manufacturers; Surface Mounted:
 1. Norton; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Closers: Comply with BHMA A156.4, Grade 1.
 1. Type: Surface mounted to door.
 2. Provide door closer on each exterior door.

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2.09 OVERHEAD STOPS AND HOLDERS

- A. Manufacturers:
 - 1. Rixson; an Assa Abloy Group company: www.assaabloydss.com/#sle.
- B. Overhead Stops and Holders (Door Checks): Comply with BHMA A156.8, Grade 1.
 - 1. Provide stop as specified in door hardware schedule.

2.10 KICK PLATES

- A. Manufacturers:
 - 1. Ives, an Allegion brand: www.allegion.com/us/#sle.
 - 2. Trimco; _____: www.trimcohardware.com/#sle.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
 - 1. Size: 8 inch high by 2 inch less door width (LDW) on push side of door.

2.11 WALL STOPS

- A. Manufacturers:
 - 1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
 - 1. Type: Bumper, concave, wall stop.
 - 2. Material: Aluminum housing with rubber insert.

2.12 THRESHOLDS

- A. Manufacturers:
 - 1. Pemko; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Thresholds: Comply with BHMA A156.21.
 - 1. Provide threshold at each exterior door, unless otherwise indicated.
 - 2. Threshold Type: Pemko 171A x 72"
 - 3. Type: Flat surface.
 - 4. Material: Aluminum.
 - 5. Threshold Surface: Fluted horizontal grooves across full width.
 - 6. Field cut threshold to profile of frame and width of door sill for tight fit.
 - 7. Provide non-corroding fasteners at exterior locations.

2.13 WEATHERSTRIPPING AND GASKETING

- A. Manufacturers:
 - 1. Pemko; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
 - 1. Gasketing Type: Pemko 303AV x 72" x 84"
 - 2. Head and Jamb Type: Adjustable.
 - 3. Door Sweep Type: Encased in retainer.
 - 4. Material: Aluminum, with brush weatherstripping.

2.14 SILENCERS

- A. Manufacturers:
 - 1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
 - 1. Single Door: Provide three on strike jamb of frame.
 - 2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
 - 3. Material: Rubber, gray color.

2.15 POWER SUPPLY

- A. Manufacturers:

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1. Yale; an Assa Abloy Group company: www.assaabloydss.com.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Power Supply: Hard wired, with multiple zones providing eight (8) breakers for each output panel with individual control switches and LED's; UL (DIR) Class 2 listed.
1. Power: 24 VDC 10 amp; with 120 VAC power supply.
 2. Operating Temperature: 32 to 110 degrees F.
 3. Provide with emergency release terminals that release devices upon activation of fire alarm system.

2.16 FINISHES

- A. Finishes: Identified in Section 08 0671 - Door Hardware Schedule.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. per ADA and building code standards .
- D. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing under provisions of Section 01 4000 - Quality Requirements.

3.04 ADJUSTING

- A. Adjust work under provisions of Section 01 7000 - Execution and Closeout Requirements.
- B. Adjust hardware for smooth operation.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.
- D. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.

3.06 PROTECTION

- A. Protect finished Work under provisions of Section 01 7000 - Execution and Closeout Requirements.
- B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

SECTION 08 8000 GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Plastic films.
- D. Glazing compounds.

1.02 RELATED REQUIREMENTS

- A. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors.
- B. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. AAMA 501.6 - Recommended Dynamic Test Method for Determining the Seismic Drift Causing Glass Fallout from Window Wall, Curtain Wall and Storefront Systems; 2018.
- C. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
- D. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.
- E. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).
- F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
- G. ASTM C1036 - Standard Specification for Flat Glass; 2025.
- H. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.
- I. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.
- J. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.
- K. ASTM E413 - Classification for Rating Sound Insulation; 2022.
- L. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.
- M. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.
- N. GANA (GM) - GANA Glazing Manual; 2022.
- O. GANA (LGRM) - Laminated Glazing Reference Manual; 2019.
- P. GANA (SM) - GANA Sealant Manual; 2008.
- Q. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (Reaffirmed 2016).
- R. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data on Insulating Glass Unit, Glazing Unit, and Plastic Film Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit 1 samples 8 by 8 inch in size of glass units.
- E. Manufacturer's qualification statement.
- F. Installer's qualification statement.

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- G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.06 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 3. Glass thicknesses listed are minimum.
- B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
 - 1. In conjunction with weather barrier related materials described in other sections, as follows:
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
 - 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.02 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 - 1. Type and Thickness as indicated on drawings.
 - 2. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 - 3. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
 - 4. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 - 5. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

2.03 INSULATING GLASS UNITS

- A. Insulating Glass Units: Types as indicated in drawings.
 - 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.

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2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Spacer Color: Black.
4. Edge Seal:
 - a. Color: Black.
5. Purge interpane space with dry air, hermetically sealed.

2.04 BASIS OF DESIGN - INSULATING GLASS UNITS

- A. Basis of Design - Insulating Glass Units: Vision glazing, with low-e coating.
 1. Applications: Exterior insulating glass glazing unless otherwise indicated.
 2. Space between lites filled with air.
 3. Total Thickness: As indicated on drawings.
 4. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 5. Spacer Color: Black.
 6. Edge Seal:
 7. Color: Black.
 8. Purge interpane space with dry air, hermetically sealed.

2.05 PLASTIC FILMS

- A. Decorative Plastic Film: Polyvinyl butyral (PVB) type.
 1. Application: Locations as indicated on drawings.
 2. Series Type: Match existing window film from break room in Building 2..
 3. Color: Match color of existing window film from break room in Building 2.
 4. Manufacturers:
 - a. Avery Dennison: www.averydennison.com/#sle.
 - b. LLumar, an Eastman Chemical Company; Decorative Window Film, LLumar: www.llumar.com/#sle.
 - c. XPEL, Inc; DECORATIVE: www.xpel.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.06 GLAZING COMPOUNDS

- A. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

2.07 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Tape: Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air barrier and vapor retarder seal; ___x___ inch size.
- D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
- E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

SECTION 08 8000 GLAZING

- C. Verify that sealing between joints of glass framing members has been completed effectively.
- D. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.04 INSTALLATION - BUTT JOINT GLAZING METHOD (SEALANT ONLY)

- A. Application - Exterior Glazed: Set glazing infills from exterior side of building.
- B. Temporarily brace glass in position for duration of glazing process; mask edges of glass at adjoining glass edges and between glass edges and framing members.
- C. Temporarily secure a small diameter nonadhering foamed rod on back side of joint.
- D. Apply sealant to open side of joint in continuous operation; thoroughly fill joint without displacing foam rod, and then tool sealant surface smooth to concave profile.
- E. Permit sealant to cure then remove foam backer rod, and then apply sealant to opposite side, tool smooth to concave profile.
- F. Remove masking tape.

3.05 INSTALLATION - PLASTIC FILM

- A. Install plastic film with adhesive, applied in accordance with film manufacturer's instructions.
- B. Place without air bubbles, creases or visible distortion.
- C. Install film tight to perimeter of glass and carefully trim film with razor sharp knife. Provide 1/16 inch to 1/8 inch gap at perimeter of glazed panel unless otherwise required. Do not score the glass.

3.06 FIELD QUALITY CONTROL

- A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures and unacceptable conditions.

3.07 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

SECTION 08 8000 GLAZING

3.08 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

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SECTION 09 2116 GYPSUM BOARD ASSEMBLIES - USG

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Metal grid or channel ceiling framing.
- D. Gypsum wallboard.
- E. Joint treatment and accessories.
- F. Insulation.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
- B. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).
- 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; 2025a.
- D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2025.
- E. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).
- F. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2020).
- G. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2026).
- H. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2024.
- I. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.
- J. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- K. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2025.
- L. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.
- M. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.
- N. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.
- O. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.
- P. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2024.
- Q. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- R. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

SECTION 09 2116 GYPSUM BOARD ASSEMBLIES - USG

- C. Product Data: Include data on metal framing, gypsum board, glass mat faced gypsum board, sheathing, accessories, and joint finishing system.
- D. Product Data: Include manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- E. Installer's qualification statement.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 3 years of experience.

PART 2 PRODUCTS

2.01 WALL ASSEMBLY TYPES

- A. See drawings for graphic representations of assemblies.

2.02 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.

2.03 METAL FRAMING MATERIALS

- A. Manufacturers - Metal Framing, Connectors, and Accessories:
 - 1. CEMCO: www.cemcosteel.com/#sle.
 - 2. ClarkDietrich: www.clarkdietrich.com/#sle.
 - 3. Marino: www.marinoware.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
 - 1. Studs: "C" shaped with knurled or embossed faces.
 - 2. Runners: U shaped, sized to match studs.
 - 3. Ceiling Channels: C-shaped.
 - 4. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.
 - 5. Resilient Furring Channels: Single or double leg configuration; 1/2 inch channel depth.
 - a. Products:
 - 1) Same manufacturer as other framing materials.
- C. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
 - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
 - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.
 - 3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.
- D. Deflection and Firestop Track: Intumescent strip factory-applied to track flanges expands when exposed to heat or flames to provide a perimeter joint seal.
- E. Preformed Top Track Firestop Seal:
 - 1. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.
- F. Non-structural Framing Accessories:
 - 1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
 - 2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
 - a. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.
 - b. Height: 35-3/4 inches.
 - c. Products:
 - 1) ClarkDietrich.com.

2.04 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:

SECTION 09 2116 GYPSUM BOARD ASSEMBLIES - USG

1. USG Corporation: www.usg.com/#sle.
 2. CertainTeed Corporation: www.certainteed.com/#sle.
 3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Gypsum Board: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
 3. Thickness:
 - a. Vertical Surfaces: As indicated on drawings.
 - b. Ceilings: 5/8 inch.
 - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
- C. Abuse Resistant Panels:
1. Application: High-traffic areas indicated.
 2. Surface Abrasion: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
 3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
 4. Soft Body Impact: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
 5. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 6. Type: Fire-resistance-rated Type X, UL or WH listed.
 7. Edges: Tapered.
- D. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
1. Application: Vertical surfaces behind thinset tile, except in wet areas.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Type: Regular, in locations indicated.
 4. Regular Board Thickness: 1/2 inch.
 5. Edges: Tapered.

2.05 GYPSUM WALLBOARD ACCESSORIES

- A. Glass Fiber Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
1. Products:
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless otherwise indicated.
1. Types: As detailed or required for finished appearance.
 2. Special Shapes: In addition to conventional corner bead and control joints, provide L-bead at exposed panel edges.
 3. Products:
 - a. Same manufacturer as framing materials.
- D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
 2. Ready-mixed vinyl based joint compound.
 3. Powder-type vinyl based joint compound.
 4. Chemical hardening type compound.
- E. Fasteners and Adhesives: Products recommended by gypsum board manufacturer.
1. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

SECTION 09 2116 GYPSUM BOARD ASSEMBLIES - USG

2. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.
3. Nails for Attachment to Wood Members: ASTM C514.
4. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
5. Adhesive for Attachment to Wood, ASTM C557 and Metal:

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
 1. Level ceiling system to a tolerance of 1/1200.
 2. Laterally brace entire suspension system.
 3. Install bracing as required at exterior locations to resist wind uplift.
- C. Studs: Space studs at 16 inches on center.
 1. Extend partition framing to structure where indicated and to ceiling in other locations.
 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
 3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- E. Standard Wall Furring: Install at concrete and masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
 1. Orientation: Vertical.
 2. Spacing: As indicated.
- F. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.
- G. Blocking: Install wood blocking for support of:
 1. Framed openings.
 2. Wall-mounted cabinets.
 3. Plumbing fixtures.
 4. Wall-mounted door hardware.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.04 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- C. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- D. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.
- E. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
 1. Single-Layer Applications: Adhesive application.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

- A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
 - 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 3. Level 3: Walls to receive textured wall finish.
 - 4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - 5. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
- D. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.07 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

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SECTION 09 5100 ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.02 REFERENCE STANDARDS

- A. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.
- B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019 (Reapproved 2025).
- C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2024a.
- D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.05 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Suspension Systems:
 - 1. Same as for acoustical units.
 - 2. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACOUSTICAL UNITS

- A. Unit type as indicated on drawings.
- B. Acoustical Units - General: ASTM E1264, Class A.

2.03 SUSPENSION SYSTEMS

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold-down clips, stabilizer bars, clips, and splices as required.
- B. Type as indicated on drawings.

SECTION 09 5100 ACOUSTICAL CEILINGS

2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Perimeter Moldings: Same metal and finish as grid.
- D. Acoustical Insulation: ASTM C665 friction fit type, unfaced batts.
 - 1. Thickness: 3-1/2 inch.
 - 2. Size: To fit acoustical suspension system.
- E. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions, as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
- D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
- E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- I. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- E. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.
 - 2. Double cut and field paint exposed reveal edges.
- F. Where round obstructions occur, provide preformed closures to match perimeter molding.
- G. Lay acoustical insulation for a distance of 48 inches either side of acoustical partitions as indicated.
- H. Install hold-down clips on panels within 20 ft of an exterior door.

SECTION 09 5100 ACOUSTICAL CEILINGS

3.05 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

- A. Clean surfaces.
- B. Replace damaged or abraded components.

END OF SECTION

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SECTION 09 6500 RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient sheet flooring.
- B. Resilient base.
- C. Installation accessories.

1.02 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- B. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021 (Reapproved 2025).
- C. ASTM F1913 - Standard Specification for Vinyl Sheet Floor Covering Without Backing; 2019 (Reapproved 2025).

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- D. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- E. Installer's Qualification Statement.
- F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Flooring Material: 5% attic stock of each type and color.
 - 3. Extra Wall Base: _____ linear feet of each type and color.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- D. Protect roll materials from damage by storing on end.
- E. Do not double stack pallets.

1.06 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 SHEET FLOORING

- A. Vinyl Sheet Flooring: Homogeneous without backing, with color and pattern throughout full thickness with flash cove base.
 - 1. Manufacturers:
 - a. Gerflor USA, Inc; Mipolam Affinity: www.gerflorusa.com#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
 - 2. Minimum Requirements: Comply with ASTM F1913.
 - 3. Thickness: 0.080 inch nominal.
 - 4. Integral coved base with cap strip.

SECTION 09 6500 RESILIENT FLOORING

5. Color: As indicated on drawings.

2.02 RESILIENT BASE

- A. Resilient Base: ASTM F1861, Type TP, rubber, thermoplastic; Style B, Cove.
 1. Manufacturers:
 - a. Tarkett Flooring: www.tarkett.com/#sle.
 2. Height: 4 inches.
 3. Thickness: 0.125 inch.
 4. Finish: Satin.
 5. Color: As indicated on drawings.

2.03 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
- C. Adhesive for Vinyl Flooring:
 1. Type recommended by flooring manufacturer.
- D. Moldings, Transition and Edge Strips: Same material as flooring.
- E. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
- C. Prohibit traffic until filler is fully cured.
- D. Clean substrate.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 1. Fit joints and butt seams tightly.
 2. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 1. Metal Strips: Attach to substrate before installation of flooring using stainless steel screws.
 2. Resilient Strips: Attach to substrate using adhesive.
- F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- G. At movable partitions, install flooring under partitions without interrupting floor pattern.

SECTION 09 6500 RESILIENT FLOORING

3.04 INSTALLATION - SHEET FLOORING

- A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.
- B. Coved Base: Install as detailed on drawings, using coved base filler as backing at floor to wall junction. Extend sheet flooring vertically to height indicated, and cover top edge with metal cap strip.

3.05 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

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SECTION 09 6813 TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile, fully adhered.
- B. Removal of existing carpet tile.

1.02 RELATED REQUIREMENTS

- A. Section 01 7419 - Construction Waste Management and Disposal: Reclamation/Recycling of new carpet tile scrap and removed carpet tile.

1.03 REFERENCE STANDARDS

- A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025a.
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- E. CRI 104 - Standard for Installation of Commercial Carpet; 2018.
- F. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Shop Drawings: Indicate direction of carpet pile.
- D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- E. Accessory Samples: Submit two 4 inch long samples of edge strip and base cap.
- F. Sustainable Design Submittal: Submit VOC content documentation for adhesives.
- G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- H. Installer's Qualification Statement.
- I. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.06 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Tile Carpeting:
 - 1. Milliken & Company; OBEX Tile - CutX: www.milliken.com/#sle.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

- A. Tile Carpeting: Tufted, manufactured in one color dye lot.
 - 1. Product: Journal - Freehand manufactured by Milliken & Company.
 - 2. Tile Size: 20by20 inch, nominal.

SECTION 09 6813 TILE CARPETING

3. Color: As indicated on drawings. .
4. Pattern: As indicated on drawings. .
5. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
6. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").

2.03 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Edge Strips: Embossed aluminum, color as selected by Architect.
- C. Adhesives:
 1. Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI (GLP) certified; in lieu of labeled product, independent test report showing compliance is acceptable.
- D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 1. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Remove existing carpet tile.
- B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- C. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- E. Vacuum clean substrate.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in pattern indicated on drawings, with pile direction parallel to next unit, set parallel to building lines.
- F. Fully adhere carpet tile to substrate.
- G. Trim carpet tile neatly at walls and around interruptions.
- H. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 9113 EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Floors, unless specifically indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 05 5000 - Metal Fabrications: Shop-primed items.
- B. Section 05 5100 - Metal Stairs: Shop-primed items.
- C. Section 09 9123 - Interior Painting.

1.03 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
- B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- D. SSPC-SP 2 - Hand Tool Cleaning; 2024.
- E. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures.
- E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

SECTION 09 9113 EXTERIOR PAINTING

- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
 - 1. If a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- B. Paints:
 - 1. Base Manufacturer: PPG: www.ppg.com.
- C. Primer Sealers: Same manufacturer as top coats.
- D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: As indicated on drawings.

SECTION 09 9113 EXTERIOR PAINTING

2.03 PAINT SYSTEMS - EXTERIOR

- A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including primed metal.
 - 1. Two top coats and one coat primer.

2.04 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 - 2. Prepare surface according to SSPC-SP 2.
- G. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.
- H. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

SECTION 09 9113 EXTERIOR PAINTING

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 9123 INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Mechanical and Electrical:
 - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Marble, granite, slate, and other natural stones.
 - 6. Floors, unless specifically indicated.
 - 7. Ceramic and other tiles.
 - 8. Brick, architectural concrete, cast stone, integrally colored plaster, and stucco.
 - 9. Glass.
 - 10. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 05 5000 - Metal Fabrications: Shop-primed items.
- B. Section 05 5100 - Metal Stairs: Shop-primed items.
- C. Section 09 9113 - Exterior Painting.

1.03 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020 (Reapproved 2025).
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- E. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.
- F. SSPC-SP 13/NACE No.6 - Surface Preparation of Concrete; 2018.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
 - 2. Cross-reference to specified paint system products to be used in project; include description of each system.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
- D. Test and Evaluation Reports: Adhesion testing reports.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.

SECTION 09 9123 INTERIOR PAINTING

- F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gal of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience and approved by manufacturer.
- B. Preconstruction Testing: Adhesion Testing.
 - 1. At request of Architect conduct adhesion test at indicated areas. Architect will select a minimum of three surfaces to represent surfaces and conditions for adhesion testing.
 - 2. Conduct testing in accordance with ASTM D3359 after minimum 7 day cure time of coating to be tested.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.
- D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 fc measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
 - 1. If a single manufacturer cannot provide specified products; minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- B. Paints:
 - 1. Base Manufacturer: PPG: www.ppg.com.
- C. Primer Sealers: Same manufacturer as top coats.
- D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

SECTION 09 9123 INTERIOR PAINTING

3. Supply each paint material in quantity required to complete entire project's work from a single production run.
 4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- D. Colors: As indicated on drawings.
1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.03 PAINT SYSTEMS - INTERIOR

- A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, wood, plaster, uncoated steel, shop primed steel, galvanized steel, aluminum, and acoustical ceilings.
1. Two top coats and one coat primer.
- B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades.
 2. Two top coats and one coat primer.
- C. Paint I-OP-MD-WC - Medium Duty Overhead: Including gypsum board.
1. Two top coats and one coat primer.
- D. Paint I-TR-C - Transparent Finish on Concrete Floors.
1. 2 coats sealer.
 2. Sealer: Water Based Sealer for Concrete Floors.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Alkali Resistant Water Based Primer.
 2. Interior Institutional Low Odor/VOC Primer Sealer.
 3. Interior Rust-Inhibitive Water Based Primer.
 - a. Application: Metal (steel, galvanized and aluminum).

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been adequately prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.

SECTION 09 9123 INTERIOR PAINTING

- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Plaster and Stucco: 12 percent.
 - 3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 - 4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 5. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Concrete:
 - 1. Prepare surface as recommended by top coat manufacturer and in accordance with SSPC-SP 13/NACE No.6.
- F. Masonry:
- G. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- I. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high-alkali surfaces.
- J. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- K. Galvanized Surfaces:
- L. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.
- M. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer.
- N. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- E. Sand wood and metal surfaces lightly between coats to achieve required finish.
- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

SECTION 09 9123 INTERIOR PAINTING

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

3.06 SCHEDULE - PAINT SYSTEMS

END OF SECTION

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SECTION 10 1423 PANEL SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Panel signage.

1.02 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.
- C. Shop Drawings:
 - 1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
 - 2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - b. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - c. Submit for approval by Owner through Architect prior to fabrication.
- D. Samples: Submit two samples of each type of sign, of size similar to that required for project, indicating sign style, font, and method of attachment.
- E. Verification Samples: Submit samples showing colors, materials, and finishes specified.
- F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- G. Manufacturer's qualification statement.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store under cover and elevated above grade.
- D. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Panel Signage:
 - 1. Modulex: www.modulex.com
 - 2. Best Sign Systems, Inc: www.bestsigns.com/#sle.
 - 3. FASTSIGNS International, Inc: www.fastsigns.com/#sle.
 - 4. Mohawk Sign Systems, Inc: www.mohawksign.com/#sle.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

- A. Accessibility Requirements: 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 restrictive requirements.

SECTION 10 1423 PANEL SIGNAGE

2.03 PANEL SIGNAGE

- A. Panel Signage:
 - 1. Match existing Panel Signage.
 - 2. Application: Room and door signs.
 - 3. Description: Flat signs with engraved panel media, tactile characters.
 - 4. Sign Size: As indicated on drawings.
 - 5. Total Thickness: 3/8 inch.
 - 6. Backer Thickness: 1/4 inch.
 - 7. Sign Edges: Bevelled.
 - 8. Color and Font, unless otherwise indicated:
 - 1) Character Font: Frutiger 67 condensed bold plus 10 kerning.
 - 2) Character Case: Upper and lower case (title case).
 - 3) Background Color: Romark 341-502 Blue & Romark 341-304 Silver.
 - 4) Edge Color: Romark 341-901 Green.
 - 5) Character Color: Contrasting color.
 - b. Material: Solid Romark Acrylic materials. 1/8" face, 1/4" backer, laser cut with bevelled edge face. Laser cut 1/32" solid ADA Romark lettering. Material surface applied to face of panel. Face of backer routed in 1/32" deep for insert and 1/8" deep for right side thumbhole. Semi Matte window face subsurface painted borders with clear visible window. Insert is 0.30" Romark solid material face and edges. Printed or vinyl text.
 - c. Profile: Flat panel in matching plastic frame.
- 9. Tactile Letters: Raised 1/32 inch minimum.
- 10. Braille: Grade II, ADA-compliant.
 - 1) Applied clear to bottom footer.
 - b. One-Sided Wall Mounting: Tape adhesive and silicone..
 - c. Glazing Mounting: Tape adhesive and silicone.
 - 1) Include 1/8" Romark material with same 1/8" bevelled edge around perimeter to cover mounting on opposite side of glass.

2.04 SIGNAGE APPLICATIONS

- A. Room and Door Signs:

2.05 ACCESSORIES

- A. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify that power and data service is correctly sized and located to accommodate panel signs.
- C. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install with horizontal edges level.
- C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 2239 FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Top-supported folding panel partitions, horizontal opening.

1.02 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- C. ASTM E413 - Classification for Rating Sound Insulation; 2022.
- D. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation Between Spaces Separated by Operable Partitions; 2012 (Reapproved 2026).
- E. ASTM F793/F793M - Standard Classification of Wall Coverings and Ceiling Coverings by Use Characteristics; 2025.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on partition materials, operation, hardware and accessories, electric operating components, track switching components, and colors and finishes available.
- C. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, static and dynamic loads, location and details of pass door and frame, adjacent construction and finish trim, and stacking depth.
- D. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.
 - 1. Include samples of accessories involving color selection.
- E. Samples for Review: Submit two samples of surface finish, 12 by 12 inches size, illustrating quality, colors selected, texture, and weight.
- F. Certificates: Certify that partition system meets or exceeds specified acoustic requirements.
- G. Manufacturer's Instructions: Indicate special procedures.
- H. Installer's qualification statement.
- I. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design under direct supervision of Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until installation.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide two year manufacturer warranty against defects in material and workmanship, excluding abuse.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Folding Panel Partitions - Horizontal Opening:

SECTION 10 2239 FOLDING PANEL PARTITIONS

1. Basis of Design: Kwik-Wall Company; 3000 Series Operable Walls: www.kwik-wall.com/#sle.
2. Hufcor, Inc; www.hufcoramerica.com
3. Moderco, Inc: www.moderco.com/#sle.
4. Modernfold, a DORMA Group Company: www.modernfold.com/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FOLDING PANEL PARTITIONS - HORIZONTAL OPENING

- A. Folding Panel Partitions: Side opening; continuous hinged panels; side stacking; motor operated.
 1. Base Bid includes manually operated folding panel partition.
 2. Alternate # 1 includes motor operated folding panel partition.
- B. Panel Construction:
 1. Per manufacturers 3050 series partitions.
 - a. Panel Properties:
 - 1) Thickness With Finish: 4 inches.
- C. Panel Finishes:
 1. Facing: Vinyl coated fabric.
 2. Exposed Metal Trim: Custom powder coated paint finish.
- D. Panel Seals:
 1. Panel to Panel Seals: Grooved and gasketed astragals, with continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
 2. Acoustic Seals: Flexible acoustic seals at jambs, meeting mullions, ceilings, retractable floor and ceiling seals, and above track to structure acoustic seal.
- E. Suspension System:
 1. Track: Formed steel; 1-1/4 by 1-1/4 inch size; thickness and profile designed to support loads, steel sub-channel and track connectors, and track switches.
 2. Carriers: Nylon wheels on trolley carrier at top of every second panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.
- F. Performance:
 1. Acoustic Performance:
 - a. Sound Transmission Class (STC): 38 to 42 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.
 2. Surface Burning Characteristics of Panel Finish: Flame spread/smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
 3. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.
- G. Operation:
 1. Electric Operator: 12 inches per second traveling speed; adjustable friction clutch brake actuated by solenoid controlled motor starter; enclosed limit switch; enclosed magnetic reversing starter.
 2. Control Station: Two standard keyed, three button OPEN-STOP-CLOSE type; 24 volt circuit; surface mounted.
 - a. Key switch prepared for mortise lock cylinder.
 - b. Key switches alike.
 3. Safety Features:
 - a. Limit Switches: Automatic type, at both extremes of travel, to prevent over-travel.
 - b. Emergency Release: Mechanism to disengage motor drive system and permit manual operation.
 - c. Pocket Door Interlock: Mechanism to prevent operation of panels unless storage pocket doors are fully open.
 4. Electrical Requirements:
 - a. Per manufacturers recommendations.
- H. Accessories:
 1. Pocket Enclosures: Door, frame, and trim to match adjacent walls.

SECTION 10 2239 FOLDING PANEL PARTITIONS

2. Acoustic Sealant: As recommended by partition manufacturer.

2.03 MATERIALS

- A. Vinyl Coated Fabric: ASTM F793 Category VI, polyvinyl fluoride (PVC) finish for washability and improved flame retardance; color as selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that required utilities are available, of the correct characteristics, in proper location, and ready for use.
- C. Verify track supports are laterally braced and will permit track to be level within 1/4 inch of required position and parallel to the floor surface.
- D. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.
- E. Verify wall plumbness of 1/8 inch in 10 feet, non-cumulative.

3.02 INSTALLATION

- A. Install partition in accordance with manufacturer's instructions and ASTM E557.
- B. Install electric operator, wiring, and controls. Locate control station(s) as indicated.
- C. Fit and align partition assembly and pocket doors level and plumb.
- D. Lubricate moving components.
- E. Install acoustic sealant to achieve required acoustic performance.
- F. Coordinate electrical connections.

3.03 ADJUSTING

- A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.
- B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.
- C. Adjust partition assembly to achieve lightproof seal.

3.04 CLEANING

- A. Clean finish surfaces and partition accessories.

3.05 CLOSEOUT ACTIVITIES

- A. Demonstrate operation of partition and identify potential operational problems.

END OF SECTION

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SECTION 10 2600 WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Corner guards.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Blocking for wall and corner guard anchors.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
 - 1. Submit two sections of corner guards, 24 inches long.
- C. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
- F. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.
- B. Protect work from moisture damage.
- C. Protect work from UV light damage.
- D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.
- E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for metal crash rails. Complete forms in Owner's name and register with manufacturer.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures or internal connection failures.
 - b. Deterioration of materials beyond that expected of normal use, as intended by manufacturer.
- C. Installer Warranty: Provide 2-year warranty for metal crash rails commencing on Date of Substantial Completion. Complete forms in Owner's name and register with installer.
 - 1. Failures include, but are not limited to, the following:
 - a. Detachment of rail system from substrate.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Corner Guards and Protective Corridor Handrails:
 - 1. Construction Specialties, Inc; Acrovyn Handrails: www.c-sgroup.com/#sle.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PRODUCT TYPES

- A. Corner Guards - Surface Mounted:
 - 1. Material: Type 304 stainless steel, No.4 finish.
 - 2. Model: CO-8 90 Degree Corner where indicated on drawings.
 - 3. Model: SCO-8 Channel Guard where indicated on drawings.
 - 4. Corner: Square.

SECTION 10 2600 WALL AND DOOR PROTECTION

5. Color: As indicated.
6. Length: One piece, 48 inches.
7. Mounting: Countersunk screws through factory-drilled holes.

2.03 FABRICATION

- A. Fabricate components with tight joints, corners and seams.
- B. Pre-drill holes for attachment.
- C. Form end trim closure by capping and finishing smooth.

2.04 SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
- B. Verify that field measurements are as indicated on drawings.
- C. Verify that substrate surfaces for adhered items are clean and smooth.
 1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.
- D. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Position corner guard to match existing corner guards in building.

3.03 TOLERANCES

- A. Maximum Variation From Required Height: 1/8 inch.

3.04 CLEANING

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 10 4400 FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.

1.02 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.
- B. FM (AG) - FM Approval Guide; Current Edition.
- C. NFPA 10 - Standard for Portable Fire Extinguishers; 2026.
- D. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide extinguisher operational features.
- C. Certificate: Certify products of this section meet or exceed specified requirements.
- D. Operation and Maintenance Data: Include test, refill, or recharge schedules and recertification requirements.

1.04 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature causes freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical: www.activarcpg.com/#sle.
 - 2. Ansul, a Tyco Business; Cleanguard: www.ansul.com/#sle.
 - 3. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
 - 4. Pyro-Chem, a Tyco Business: www.pyrochem.com/#sle.
 - 5. Amerex Corporation. www.amerex-fire.com.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Fire Extinguisher Cabinets and Accessories:
 - 1. Activar Construction Products Group, Inc. - JL Industries; Ambassador Series: www.activarcpg.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
 - 3. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
 - 4. Potter-Roemer: www.potterroemer.com/#sle.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

- A. General Requirements: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
 - 1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated on drawings.
- B. Multipurpose Dry-Chemical-Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Cartridge Operated: Spun shell.
 - 2. Class: A:B:C.
 - 3. Size: 5 lb.
 - 4. Finish: Baked polyester powder coat; red color.
 - 5. Temperature Range: Minus 65 to 120 degrees F.

2.03 FIRE EXTINGUISHER CABINETS

- A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire-resistance rating of walls where cabinet installed.
- B. Cabinet Construction: Non-fire rated.
 - 1. Formed stainless steel sheet; 20-gauge, 0.036-inch thick base metal.
- C. Cabinet Configuration: Match existing type.

SECTION 10 4400 FIRE PROTECTION SPECIALTIES

1. Size to accommodate accessories.
- D. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled holes for placement of anchors.
- E. Fabrication: Weld, fill, and grind components smooth.
- F. Finish of Cabinet Exterior Trim and Door: Match existing.
- G. Finish of Cabinet Interior: Match existing.

2.04 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.
- B. Cabinet Signage: Fire Extinguisher.
- C. Lettering: FIRE EXTINGUISHER text on decal or self-adhesive vinyl, prespaced black lettering in accordance with authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and interfaces with other work.
- B. Verify substrate and site conditions for product installation are in accordance with manufacturer's written instructions.
- C. Verify rough openings for cabinet are sized and located in accordance with manufacturer's written instructions.
- D. Notify Architect in writing of conditions detrimental to completion of work. Do not proceed with installation until detrimental conditions are corrected.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure rigidly in place.
- C. Place extinguishers in cabinets.

END OF SECTION

SECTION 12 3200 MANUFACTURED WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Manufactured standard and custom casework, with cabinet hardware.
- B. Countertops.

1.02 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- B. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2026.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- E. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- F. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material; 2013.
- G. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements, placement dimensions and tolerances, clearances required, and keying information.
- C. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 2 inches by 3 inches.
 - 1. Plastic laminate samples, for color, texture, and finish selection.
- D. Manufacturer's Installation Instructions.
- E. Maintenance Data: Manufacturer's recommendations for care and cleaning.
- F. Finish touch-up kit for each type and color of materials provided.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.
- B. Acceptance at Site:
 - 1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.
- C. Storage:
 - 1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" Article of this section.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a One year period after Date of Substantial Completion, at no additional cost to Owner. Defects include, but are not limited to:
 - 1. Ruptured, cracked, or stained finish coating.
 - 2. Discoloration or lack of finish integrity.

SECTION 12 3200 MANUFACTURED WOOD CASEWORK

3. Cracking or peeling of finish.
4. Delamination of components.
5. Failure of adhesives.
6. Failure of hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Plastic Laminate Casework:
 1. Manufacturers as indicated on drawings.

2.02 CASEWORK, GENERAL

- A. Quality Standard: AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Plastic Laminate Faced Cabinets: Custom Grade.

2.03 FABRICATION

- A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.
- B. Construction: As required for selected grade.
- C. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- D. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.

2.04 PLASTIC-LAMINATE-CLAD CASEWORK

- A. Plastic-Laminate-Clad Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base cabinets.
 1. Style as indicated on drawings.
 2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
 3. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.
 - a. Finish: Matte or suede, gloss rating of 5 to 20.
 - b. Surface Color and Pattern: As indicated on drawings.
 - c. Exposed Interior Surfaces: Thermally fused laminate.
 - 1) Color: White.

2.05 COUNTERTOPS

- A. Types: More than one type is required. See drawings for location of each type of countertop.
- B. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Custom Grade, unless otherwise noted.
- C. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
 1. Provide countertop manufacturer and color as indicated on the drawings.
 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - b. Color and Pattern: As indicated on drawings.
 3. Manufacturer's standard configuration for exposed edges, back and end splashes.
 - a. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick.

2.06 CABINET HARDWARE

- A. Locks: Provide locks on all new casework cabinets.
 1. Manufacturer: CompX
 2. Lock Body Model: CB-193
 3. Lock Core Model: LP-101Tkey

SECTION 12 3200 MANUFACTURED WOOD CASEWORK

4. Lock Strike Model: SP-101-1
- B. Swinging Doors: Hinges, pulls, and catches.
 1. Hinges: Concealed, number as required by referenced standards for width, height, and weight of door.
 - a. Concealed Hinges: Installed in cabinet edge, and on door back.
 - 1) Manufacturer: Blum
 - 2) Model: #71T6580/ #174H70180
 2. Pulls: Stainless Steel Bar pull, 4 inches wide.
 - a. Manufacturer: Glide Rite
 - b. Model: #GR-5001-96-SS-1

2.07 MATERIALS

- A. Wood-Based Materials:
 1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications, complying with Grade requirements, and standard with the manufacturer.

2.08 ACCESSORIES

- A. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- B. Concealed Joint Fasteners: Corrosion-resistant, standard with manufacturer.
- C. Grommets: Standard plastic grommets for cut-outs, in color to match adjacent surface.
- D. Sealant for Use in Casework Installation:
 1. Manufacturer's recommended type.

PART 3 EXECUTION

3.01 PREPARATION

- A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

3.02 EXAMINATION

- A. Site Verification of Environmental Conditions:
 1. Do not deliver casework until the following conditions have been met:
 - a. Building has been enclosed (windows and doors sealed and weather-tight).
 - b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
 - c. Ceiling, overhead ductwork, piping, and lighting have been installed.
 - d. Installation areas do not require further "wet work" construction.
- B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.
- C. Verify adequacy of support framing and anchors.
- D. Verify that service connections are correctly located and of proper characteristics.

3.03 INSTALLATION

- A. Perform installation in accordance with manufacturer's instructions.
- B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.
- C. Set casework items plumb and square, securely anchored to building structure.
- D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.
- E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:

SECTION 12 3200 MANUFACTURED WOOD CASEWORK

1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
 2. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
 3. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
 4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
- F. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.
- G. Install hardware uniformly and precisely.
- H. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.
- I. Replace units that are damaged, including those that have damaged finishes.

3.04 ADJUSTING

- A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.05 CLEANING

- A. Clean casework and other installed surfaces thoroughly.

3.06 PROTECTION

- A. Do not permit finished casework to be exposed to continued construction activity.
- B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.
- C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION

SECTION 12 3600 COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Countertops for architectural cabinet work.
- B. Countertops for manufactured casework.

1.02 RELATED REQUIREMENTS

- A. Section 12 3200 - Manufactured Wood Casework .

1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- C. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material; 2013.
- D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- E. NSI (DSDM) - Dimensional Stone Design Manual, Version VIII; 2016.
- F. SEFA 3 - Laboratory Work Surfaces; 2020.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
- E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- G. NSI Fabricator Qualification: Documentation of Natural Stone Institute Accreditation.
- H. Installer's qualification statement.
- I. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Natural Stone Institute (NSI) Accredited Natural Stone Fabricator; www.naturalstoneinstitute.org/#sle.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Quality Standard: SEFA 3 for laboratory worksurfaces.

SECTION 12 3600 COUNTERTOPS

- C. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate.
 - 1. Flat Sheet Thickness: 1-1/4 inch, minimum.
 - 2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard stone fabrication tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Corian Design.
 - b. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with NSI (DSDM).
 - c. Finish on Exposed Surfaces: Leathered Finish.
 - d. Color and Pattern: As indicated on drawings.
 - e. Color and Pattern: As selected by Architect from manufacturer's full line.
 - 3. Other Components Thickness: 3/4 inch, minimum. Match existing.
 - 4. Back and End Splashes: Same sheet material, square top; minimum 4 inches high. Match Existing.

2.02 ACCESSORIES

- A. Fixed Top-Mounted Countertop Support Brackets:
 - 1. Material: Steel.
 - 2. Finish: Manufacturer's standard, factory-applied, textured powder coat.
 - 3. Color: Gray - Match Existing.

2.03 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
 - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 - 2. Height: 4 inches, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

- A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch wide, maximum.

SECTION 12 3600 COUNTERTOPS

3.05 CLEANING

- A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

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SECTION 21 0500 COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Above ground piping.
- B. Escutcheons.
- C. Mechanical couplings.
- D. Pipe hangers and supports.
- E. Pipe sleeves.
- F. Piping specialties.
- G. Pressure gauges.
- H. Pressure relief valves.

1.02 RELATED REQUIREMENTS

- A. Section 21 1300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.03 REFERENCE STANDARDS

- A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2025).
- B. ASME A112.18.1 - Plumbing Supply Fittings; 2024.
- C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2026.
- D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- E. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.
- F. ASME B36.10M - Welded and Seamless Wrought Steel Pipe; 2022.
- G. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.
- H. 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; 2025, with Errata.
- I. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).
- J. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2021.
- K. ASTM A536 - Standard Specification for Ductile Iron Castings; 2024.
- L. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2024.
- M. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.
- N. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40; 2023.
- O. ASTM F439 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2024.
- P. ASTM F442/F442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR); 2023.
- Q. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2022.
- R. AWWA C606 - Grooved and Shouldered Joints; 2022.
- S. FM (AG) - FM Approval Guide; Current Edition.
- T. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- U. UL 262 - Gate Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- V. UL 312 - Check Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- W. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

SECTION 21 0500 COMMON WORK RESULTS FOR FIRE SUPPRESSION

1.04 DEFERRED SUBMISSION

- A. The fire protection drawings and specifications within the Progressive Companies Document set are performance based and intended to convey scope of the work. The fire protection contractor shall submit for review and approval as a deferred submittal to the local AHJ shop drawings and hydraulic calculations indicating the sprinkler system layout, including final head locations and main/leader piping sizing. The fire protection contractor shall provide these documents sealed by a licensed fire protection engineer.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.
- C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
- D. Project Record Documents: Record actual locations of components and tag numbering.
- E. Operation and Maintenance Data: Include installation instructions and spare parts lists.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Valve Stem Packings: Two for each type and size of valve.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section.
 - 1. Minimum three years experience.
 - 2. Approved by manufacturer.
- C. Conform to FM (AG) requirements.
- D. Valves: Bear FM product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- E. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.
- F. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.
- G. Grooved couplings and fittings shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

1.08 WARRANTY

- A. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Sprinkler-based System:
 - 1. Comply with NFPA 13.
 - 2. See Section 21 1300.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.
- C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.02 ABOVE GROUND PIPING

- A. Provide black steel Schedule 40 for pipe sizes 1 1/2 inch and small with threaded or grooved end connections.

SECTION 21 0500 COMMON WORK RESULTS FOR FIRE SUPPRESSION

- B. Steel Pipe: ASTM A135/A135M Schedule 10, black.
- C. For pipe sizes greater than 1 1/2 inch provide steel pipe: ASTM A135/A135M Schedule 10, black.
 - 1. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
 - 2. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
 - 3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
 - 4. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.
- D. Where allowed by NFPA 13, CPVC Pipe: ASTM F442/F442M, SDR 13.5.
 - 1. Fittings: ASTM F438 Schedule 40, or ASTM F439 Schedule 80, CPVC.
 - 2. Joints: Solvent welded, using ASTM F493 cement.

2.03 PIPE SLEEVES

- A. Provide pipe sleeves where pipe passes entirely through poured-in-place concrete walls, floors, roofs, and partitions, or where sleeve is used as part of a listed firestop assembly. Pipe sleeve not required where penetration is core-drilled through concrete or masonry and cavities in the penetration are grouted smooth.
- B. Provide clearance between pipe and interior of sleeve or core-drill in accordance with NFPA 13.
- C. Clearances:
 - 1. Provide allowance for insulated piping.
 - 2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
 - 3. Rated Openings: Caulked tight with firestopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

2.04 ESCUTCHEONS

- A. Material:
 - 1. Metals and Finish: Comply with ASME A112.18.1.
- B. Construction:
 - 1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
 - 2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.05 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Vertical Support: Steel riser clamp.
- E. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.06 MECHANICAL COUPLINGS

- A. Manufacturers:
 - 1. Victaulic, Company: <<http://www.victaulic.com/en/>>
 - 2. Anvil International: <<http://www.anvilintl.com/>>
 - 3. Tyco Fire Products: <<http://www.tyco-fire.com/>>
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Rigid Mechanical Couplings for Grooved Joints:
 - 1. Dimensions and Testing: Comply with AWWA C606.
 - 2. Minimum Working Pressure: 300 psig.
 - 3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
 - 4. Housing Coating: Factory applied orange enamel.

SECTION 21 0500 COMMON WORK RESULTS FOR FIRE SUPPRESSION

5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.
7. Provide stops for direct stab installation without field assembly.

2.07 PIPING SPECIALTIES

- A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
 1. Activate electric alarm.
 2. Test and drain valve.
 3. Replaceable internal components without removing valve from installed position.
 4. Manufacturers:
 - a. Victaulic Company; Series 751 with Series 760 motor alarm: www.victaulic.com/#sle.
- B. Auxiliary Drains: Condensate collection drain for each section of trapped pipe in preaction or dry fire protection system.
- C. Air Venting Valves:
 1. Provide a manual air vent.
 2. Pipe the drain from air vent drain to the building exterior unless an automatic air vent is used with redundant float such that it explicitly eliminates the need for a drain as identified in the manufacturer's product data.
- D. Backflow Preventer: Reduced-pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.
- E. Commercial Riser Manifold: Preassembled and tested riser manifold in accordance with NFPA 13.
- F. Test Connections:
 1. Inspector's Test Connection for Preaction and Dry Pipe Systems:
 - a. Provide test connections approximately 6 feet above floor for each or portion of each sprinkler system equipped with an alarm device, located at most remote part of each system.
 - b. Route test connection to an open-site drain location, excluding janitor sinks, accepting full flow without negative consequences.
 - c. Supply discharge orifice with same size as corresponding sprinkler orifice.
 - d. Limit vertical height of exterior wall penetration to 2 feet above finished grade.
 2. Backflow Preventer Test Connection:
 - a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5-inch National Standard male hose threads with cap and chain.
 - b. Provide one valve for each 250 gpm of system demand or fraction thereof.
 - c. Provide permanent sign reading "Test Valve." See Section 21 0553.
- G. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome-plated gong and motor housing, nylon bearings, and inlet strainer.
- H. Electric Alarm: Electrically operated chrome-plated gong with pressure alarm switch.
- I. Water Flow Switch: Vane-type switch for mounting horizontally or vertically, with two contacts; rated 10 A at 125 VAC and 2.5 A at 24 VDC.
- J. Supervisory Switches:
 1. Provide supervisory switches for all valves which control the supply of water to the fire suppression system, in accordance with NFPA 13. Supervisory for ball and butterfly valves may be integral with the valve.

2.08 PRESSURE GAUGES

- A. Manufacturers:
 1. AGF Manufacturing: www.agfmfg.com/#sle.
- B. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
 1. Case: Steel with brass bourdon tube.

SECTION 21 0500 COMMON WORK RESULTS FOR FIRE SUPPRESSION

2. Diameter: 4-1/2 inch.
3. Mid-Scale Accuracy: One percent.
4. Scale: Display in psi and kPa.

2.09 PRESSURE RELIEF VALVES

- A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

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. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Sleeve pipes passing through partitions, walls, and floors.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Inserts:
 1. Provide inserts for placement in concrete formwork.
 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
- H. Pipe Hangers and Supports:
 1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 2. Place hangers within 12 inches of each horizontal elbow.
 3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- I. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- K. Do not penetrate building structural members unless indicated.
- L. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
 1. Aboveground Piping:
 - a. Pack solid using mineral fiber complying with ASTM C592.
 - b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
 2. All Rated Openings: Caulk tight with firestopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.
 3. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- M. Escutcheons:
 1. Install and firmly attach escutcheons at piping penetrations into finished spaces.

SECTION 21 0500 COMMON WORK RESULTS FOR FIRE SUPPRESSION

2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
 3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.
- N. 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, unions, and couplings for servicing are consistently provided.
- O. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.
- P. Provide drain valves at main shut-off valves, low points of piping and apparatus.
- Q. Grooved joints shall be installed in accordance with the manufacturer's latest published instructions.
1. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service. Gaskets shall be molded and produced by the grooved coupling manufacturer.
 2. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove.
 3. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically visit the jobsite to ensure best practices in grooved product installation are being followed. Remove and replace any improperly installed products.

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.

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Two-piece ball valves with indicators.
- B. Bronze butterfly valves with indicators.
- C. Iron butterfly valves with indicators.
- D. Check valves.
- E. Bronze OS&Y gate valves.
- F. Iron OS&Y gate valves.
- G. NRS gate valves.
- H. Indicator posts.
- I. Trim and drain valves.

1.02 RELATED REQUIREMENTS

- A. Section 21 0548 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment.
- B. Section 21 0553 - Identification for Fire Suppression Piping and Equipment.
- C. Section 21 1300 - Fire-Suppression Sprinkler Systems.

1.03 ABBREVIATIONS AND ACRONYMS

- A. EPDM: Ethylene-propylene diene monomer.
- B. NRS: Non-rising stem.
- C. OS&Y: Outside screw and yoke.
- D. PTFE: Polytetrafluoroethylene.

1.04 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2026.
- C. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300; 2021.
- D. 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; 2025, with Errata.
- E. AWWA C606 - Grooved and Shouldered Joints; 2022.
- F. FM (AG) - FM Approval Guide; Current Edition.
- G. FM 1112 - Examination Standard for Indicating Valves (Butterfly or Ball Type); 2020.
- H. FM 1120/1130 - Examination Standard for Fire Service Water Control Valves (OS&Y and NRS Type Gate Valves); 2025.
- I. FM 1140 - Examination Standard for Quick Opening Valves 1/4 Inch Through 2 Inch Nominal Size; 2024.
- J. FM 1210 - Examination Standard for Swing Check Valves; 2025.
- K. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; 2024.
- L. UL (DIR) - Online Certifications Directory; Current Edition.
- M. UL 258 - Shutoff Valves for Trim and Drain Purposes for Fire Protection Service; Current Edition, Including All Revisions.
- N. UL 262 - Gate Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- O. UL 312 - Check Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- P. UL 789 - Indicator Posts for Fire-Protection Service; Current Edition, Including All Revisions.
- Q. UL 1091 - Standard for Butterfly Valves for Fire-Protection Service; Current Edition, Including All Revisions.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.

SECTION 21 0523 GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

- 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. Where listed products are specified, provide products listed, certified, and labeled by FM (AG), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose indicated.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 1. Protect internal parts against rust and corrosion.
 2. Protect valve ends and flange faces.
 3. Set valves open to minimize exposure of functional surfaces.
- 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 and maintain at higher than ambient dew point temperature.
 - b. If outdoor storage is unavoidable, store valves off the ground in watertight enclosures.
- C. Use the following precautions for handling:
 1. Use sling to handle large valves, rig to avoid damage to exposed parts.
 2. Do not use operating handles or stems as lifting or rigging points.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Valve-End Connections:
 1. Flanges on Iron Valves: ASME B16.1 or ASME B16.42.
 2. Threaded Ends: ASME B1.20.1.
 3. Grooved Ends: AWWA C606.
- B. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
 1. Worm-gear actuator with handwheel for quarter-turn valves, except trim and drain valves.
 2. Handwheel: For other than quarter-turn trim and drain valves.
 3. Hand-lever: For quarter-turn trim and drain valves 2 NPS and smaller.

2.02 TWO PIECE BALL VALVES WITH INDICATORS

- A. UL 1091 and FM 1112 listed.
- B. Description:
 1. Minimum Pressure Rating: 175 psig.
 2. Body Design: Two piece.
 3. Body Material: Forged brass or bronze.
 4. Port Size: Full or standard.
 5. Seat: PTFE.
 6. Stem: Bronze or stainless steel.
 7. Ball: Chrome-plated brass.
 8. Actuator: Worm gear or traveling nut.
 9. Supervisory Switch: Internal or external.
 10. End Connections: Threaded or grooved.

2.03 IRON BUTTERFLY VALVES WITH INDICATORS

- A. UL 1091 and FM 1112 listed.
- B. Minimum Pressure Rating: 175 psig.
- C. Body Material: Cast or ductile iron with nylon, EPDM, epoxy, or polyamide coating.

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- D. Seat: EPDM.
- E. Stem: Stainless steel.
- F. Disc: Ductile iron with EPDM coating.
- G. Actuator: Worm gear or traveling nut.
- H. Supervisory Switch: Internal or external.
- I. Body Design: Grooved-end or wafer style.

2.04 SWING CHECK VALVES

- A. UL 312 and FM 1210 listed.
- B. Minimum Pressure Rating: 175 psig.
- C. Body Material: Cast or ductile iron.
- D. Clapper: Bronze, EPDM-coated ductile iron, or stainless steel.
- E. Seat: Bronze or EPDM-coated bronze.
- F. End Connections: Flanged.

2.05 IRON OS&Y GATE VALVES

- A. UL 262 and FM 1120/1130 listed.
- B. Minimum Pressure Rating: 175 psig.
- C. Body and Bonnet Material: Cast or ductile iron.
- D. Wedge: Cast or ductile iron, or bronze with elastomeric coating.
- E. Stem: Brass, bronze, or stainless steel.
- F. Packing: Non-asbestos PTFE.
- G. Supervisory Switch: External.

2.06 TRIM AND DRAIN VALVES

- A. Ball Valves:
 - 1. Description:
 - a. UL 258 or FM 1140 listed.
 - b. Pressure Rating: 175 psig.
 - c. Body Design: Two piece.
 - d. Body Material: Forged brass or bronze.
 - e. Port Size: Full or standard.
 - f. Seat: PTFE.
 - g. Stem: Bronze or stainless steel.
 - h. Ball: Chrome-plated brass.
 - i. Actuator: Hand-lever.
 - j. End Connections: Threaded or grooved.
- B. Angle Valves:
 - 1. Description:
 - a. UL 258 or FM 1140 listed.
 - b. Pressure Rating: 175 psig.
 - c. Body Material: Brass or bronze.
 - d. Ends: Threaded.
 - e. Stem: Bronze.
 - f. Disc: Bronze.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron, bronze, or aluminum.
- C. Globe Valves:
 - 1. Description:
 - a. UL 258 or FM 1140 listed.
 - b. Pressure Rating: 175 psig.
 - c. Body Material: Bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded.

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- e. Stem: Bronze.
- f. Disc Holder and Nut: Bronze.
- g. Disc Seat: Nitrile.
- h. Packing: Asbestos free.
- i. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Confirm valve interior to be free of foreign matter and corrosion.
- B. Remove packing materials.
- C. Examine guides and seats by operating valves from the fully open position to the fully closed position.
- D. Examine valve threads and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage.
 - 1. Check bolting for proper size, length, and material.
 - 2. Verify gasket for size, defects, damage, and suitable material composition for service.
 - 3. Replace defective valves with new valves.

3.02 INSTALLATION

- A. Install valves in accessible locations to allow for operation, inspections, tests, and maintenance.
- B. Install listed valves in accordance with their listing.
- C. Install valves in accordance with manufacturer's instructions.
- D. Support valves independently of adjacent piping.
- E. Install valves in horizontal piping with stem at or above pipe center.
- F. Position valves to allow full actuator movement.
- G. Install OS&Y valves with full clearance for rising stem. Install surrounding components so they do not interfere with nor are they impacted by full extension of rising stem.
- H. Install supervised shutoff valves in supervised-open position.
 - 1. Install permanent identification signs indicating portion of system controlled by each shutoff valve.
 - 2. Install threaded-end valves with unions upstream and downstream.
- I. Install valve tags. See Section 21 0553. Label valves in accordance with NFPA standard applying to the piping system in which valves are installed.

END OF SECTION

SECTION 21 0548 VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vibration isolation requirements.
- B. Vibration isolators.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.

1.03 DEFINITIONS

1.04 REFERENCE STANDARDS

- A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

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 3000.

1.06 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
 - 1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
 - 2. Seismic Controls: Include seismic load capacities.
- C. Field quality control test reports.

1.07 QUALITY ASSURANCE

- A. Comply with applicable building code.
- B. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five years experience designing seismic restraints for nonstructural components.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

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 fire suppression 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.

2.02 VIBRATION ISOLATORS

- A. Manufacturers:

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1. Vibration Isolators:
 - a. Kinetics Noise Control, Inc: www.kineticsnoise.com.
 - b. Mason Industries: www.mason-ind.com.
 - c. Vibration Eliminator Company, Inc: www.veco-nyc.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
 2. Source Limitations: Furnish vibration-isolators and associated accessories produced by a single manufacturer and obtained from a single supplier.
- B. General Requirements:
1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
 2. Spring Elements for Spring Isolators:
 - a. Color code or otherwise identify springs to indicate load capacity.
 - b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
 - c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
 - d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
 - e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
 - f. Selected to function without undue stress or overloading.
- C. Vibration Isolators for Nonseismic Applications:
1. Resilient Material Isolator Pads:
 - a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material.
 - b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch thickness.
 - c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.
 2. Resilient Material Isolator Mounts, Nonseismic:
 - a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material; fail-safe type.
 3. Resilient Material Isolator Hangers, Nonseismic:
 - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the lower hanger rod connection.
 4. Spring Isolator Hangers, Nonseismic:
 - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
 - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.
- 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 anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Secure fasteners according to manufacturer's recommended torque settings.
- D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

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- E. Vibration Isolation Systems:
 - 1. Isolator Hangers:
 - a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
 - b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
 - 2. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
 - 3. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
 - 4. Adjust isolators to be free of isolation short circuits during normal operation.
 - 5. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect vibration isolation and/or seismic control components for damage and defects.
- C. Provide manufacturer representative or authorized technician services to assist with inspection and testing of vibration isolation systems and seismic controls. Submit a detailed copy of manufacturer recommended inspection, testing, and field report procedures.
- D. Vibration Isolation Systems:
 - 1. Verify isolator static deflections.
 - 2. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.
- E. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.
- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

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PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe markers.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2025.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation instructions.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Automatic Controls: Tags.
- B. Control Panels: Nameplates.
- C. Instrumentation: Tags.
- D. Major Control Components: Nameplates.
- E. Piping: Pipe markers.
- F. Pumps: Nameplates.
- G. Relays: Tags.
- H. Small-sized Equipment: Tags.
- I. Valves: Nameplates and ceiling tacks where above lay-in ceilings.

2.02 NAMEPLATES

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.pipemarker.com.
 - 2. Kolbi Pipe Marker Company: www.kolbipipemarkers.com.
 - 3. Seton Identification Products, a Tricor Direct Company: www.seton.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/4 inch.
 - 3. Background Color: Black.
 - 4. Thickness: 1/8 inch.
 - 5. Plastic: Comply with ASTM D709.

2.03 TAGS

- A. Manufacturers:
 - 1. Advanced Graphic Engraving, LLC: www.advancedgraphicengraving.com.
 - 2. Brady Corporation: www.bradycorp.com.
 - 3. Brimar Industries, Inc: www.pipemarker.com.
 - 4. Kolbi Pipe Marker Company: www.kolbipipemarkers.com.
 - 5. Seton Identification Products, a Tricor Direct Company: www.seton.com.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 PIPE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradycorp.com.
 - 2. Brimar Industries, Inc: www.pipemarker.com.

SECTION 21 0553 IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

3. Kolbi Pipe Marker Company: www.kolbipipemarkers.com.
 4. Seton Identification Products, a Tricor Company: www.seton.com.
 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Color: Comply with ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.
- E. Underground Plastic Pipe Markers: Bright-colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.
- F. Color code as follows:
1. Fire Quenching Fluids: Red with white letters.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Utilize the Owner's color schemes.

3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

END OF SECTION

SECTION 21 0719 FIRE SUPPRESSION PIPING INSULATION

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 21 13 00 - Fire-Suppression Sprinklers

1.02 REFERENCE STANDARDS

- A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- C. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2024).
- D. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2025.
- E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- H. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association; 2010.
- I. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; National Fire Protection Association; 2010.
- J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

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, UL 723, ASTM E84, or UL 723.

2.02 GLASS FIBER

- A. Manufacturers:
 - 1. Basis of Design: Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: www.knaufinsulation.com/#sle.
 - 2. CertainTeed Corporation: www.certainteed.com.
 - 3. Johns Manville Corporation: www.jm.com.
 - 4. Owens Corning Corporation: www.owenscorning.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. K Value: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum Service Temperature: 850 degrees F.
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
 - 1. K Value: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum Service Temperature: 650 degrees F.
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.

SECTION 21 0719 FIRE SUPPRESSION PIPING INSULATION

- 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 inch.
- E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- F. Vapor Barrier Lap Adhesive: Compatible with insulation.
- G. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
- H. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.03 JACKETING AND ACCESSORIES

- A. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
 - 1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
 - 2. Thickness: 0.016 inch sheet.
 - 3. Finish: Smooth.
 - 4. Joining: Longitudinal slip joints and 2 inch laps.
 - 5. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
 - 6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. 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.
- D. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert Location: Between support shield and piping and under the finish jacket.
 - 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
- E. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.
- F. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
- G. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.02 SCHEDULE

- A. Piping Exposed to Freezing with Heat Tracing: 2 inch glass fiber insulation.

END OF SECTION

SECTION 21 1300 FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wet-pipe sprinkler system.
- B. System design, installation, and certification.

1.02 RELATED REQUIREMENTS

- A. Section 21 0500 - Common Work Results for Fire Suppression: Pipe and fittings.

1.03 REFERENCE STANDARDS

- A. ITS (DIR) - Directory of Listed Products; Current Edition.
- B. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
 - 2. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.
- C. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.
- D. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

1.06 QUALITY ASSURANCE

- A. Comply with UL (DIR) requirements.
- B. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience and approved by manufacturer.
- E. Equipment and Components: Provide products that bear {rs\#1} label or marking.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sprinklers, Valves, and Equipment:
 - 1. Tyco Fire Protection Products, a Tyco Business: www.tyco-fire.com.
 - 2. Viking Corporation: www.vikinggroupinc.com.
 - 3. Victaulic: www.victaulic.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SPRINKLERS

- A. Suspended Ceiling Type: Concealed pendant type with matching push on cover plate.
 - 1. Response Type: Quick.
 - 2. Coverage Type: Standard.
 - 3. Cover Plate Finish: Enamel, color white.
 - 4. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- B. Exposed Area Type: Upright type.
 - 1. Response Type: Quick.
 - 2. Coverage Type: Standard.

SECTION 21 1300 FIRE-SUPPRESSION SPRINKLER SYSTEMS

3. Finish: Brass.
 4. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
1. Response Type: Quick.
 2. Coverage Type: Standard.
 3. Finish: Brass.
 4. Escutcheon Plate Finish: Brass.
 5. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- D. Storage Sprinklers: Upright type with guard.
1. Response Type: Standard.
 2. Coverage Type: Standard.
 3. Finish: Chrome plated.
 4. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- E. Guards: Finish to match sprinkler finish.
1. Escutcheons and guards shall be listed, supplied, and approved for use with the sprinkler by the sprinkler manufacturer.
- F. Flexible Drop System: Stainless steel, multiple use, open gate type.
1. Application: Use to properly locate sprinkler heads.
 2. Include all supports and bracing.
 3. Provide braided type tube as required for the application.
 4. Manufacturers:
 - a. FlexHead Industries, a brand of Anvil International: www.anvilintl.com/#sle.
 - b. Victaulic Company; Vic-Flex: www.victaulic.com/#sle.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Install buried shut-off valves in valve box. Provide post indicator.
- D. Provide approved backflow preventer assembly at sprinkler system water source connection.
- E. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.
- F. Place pipe runs to minimize obstruction to other work.
- G. Place piping in concealed spaces above finished ceilings.
- H. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.
- I. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- J. Flush entire piping system of foreign matter.
- K. Install guards on sprinklers where indicated.
- L. Hydrostatically test entire system.
- M. Require test be witnessed by Fire Marshal.

3.02 INTERFACE WITH OTHER PRODUCTS

- A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 22 0516 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 1005 - Plumbing Piping.

1.03 REFERENCE STANDARDS

- A. EJMA (STDS) - EJMA Standards; Tenth Edition.
- B. NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum
- C. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 DESIGN REQUIREMENTS

- A. Contract Documents indicate design intent for thermal movement control.
- B. Expansion fittings and loops shall be selected and located by the installing Contractor based on actual field conditions and submitted as a deferred submittal.

1.05 SUBMITTALS

- A. See Section 01 3000 - 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, braid structure, and allowed movement
 - 2. Expansion Joints: Indicate maximum temperature and pressure rating, and allowable axial, lateral, and angular movement.
- C. Samples: Submit two low pressure compensators 3/4 inch in size.
- D. Shop Drawings:
 - 1. Locations of expansion joints, flexible connectors, anchors, and guides.
 - 2. Details showing installation, clearances, and movement direction.
- E. Manufacturer's Instructions: Indicate manufacturer's installation instructions, special procedures, and external controls.
- F. Maintenance Data: Include adjustment instructions.
- G. Project Record Documents: Record installed locations of flexible pipe connectors, expansion joints, anchors, and guides.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Comply with UL (DIR) requirements.

2.02 FLEXIBLE PIPE CONNECTORS - STEEL PIPING

- A. Manufacturers:
 - 1. Mercer Rubber Company: www.mercer-rubber.com.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Inner Hose: Stainless steel.
- C. Exterior Sleeve: Single braided, stainless steel.
- D. Pressure Rating: 125 psi up to 12 inch.
- E. Maximum Service Temperature: 450 degrees F.
- F. End Connections: Threaded.
- G. Size: Use pipe sized units.
- H. Maximum offset: 3/4 inch on each side of installed center line.

2.03 FLEXIBLE PIPE CONNECTORS - COPPER PIPING

- A. Manufacturers:
 - 1. Flex-Weld, Inc: www.kelcoind.com/#sle.
 - 2. Mercer Rubber Company: www.mercer-rubber.com.

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3. Metraflex Company: www.metraflex.com.
4. Unisource Manufacturing, Inc; Series 411, Bronze Braided Flex Connectors: www.unisource-mfg.com/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements.

- B. Inner Hose: Bronze.
- C. Exterior Sleeve: Braided bronze.
- D. Maximum Service Temperature: 450 degrees F.
- E. End Connections: Flanged.
- F. Size: Use pipe sized units.
- G. Maximum offset: 3/4 inch on each side of installed center line.
- H. Application: Copper piping.

2.04 EXPANSION JOINTS - STAINLESS STEEL BELLOWS TYPE

- A. Manufacturers:
 1. Flex-Weld, Inc; Keflex 7Q Series - Quadra-Side: www.kelcoind.com/#sle.
 2. Mercer Rubber Company: www.mercer-rubber.com.
 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Pressure Rating: 125 psi and 400 degrees F.
- C. Maximum Compression: 1-3/4 inches.
- D. Maximum Extension: 1/4 inch.
- E. Joint Type: Externally pressurized with flanged ends.
- F. Application: Steel piping 4 inches and under.

2.05 EXPANSION JOINTS - SINGLE SPHERE, FLEXIBLE CONNECTOR

- A. Manufacturers:
 1. Flex-Hose Co. Inc: www.flexhose.com/#sle.
 2. Mercer Rubber Company: www.mercer-rubber.com.
 3. Metraflex Company: www.metraflex.com.
 4. Unisource Manufacturing, Inc: www.unisource-mfg.com/#sle.
 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Body Construction: Nylon-reinforced rubber tube.
- C. End Connections: Carbon steel flanges.
- D. Cover and Tube Elastomer: EPDM and EPDM.
- E. Maximum Compression: 1/2 inch.
- F. Maximum Elongation: 3/8 inch.
- G. Maximum Offset: 3/8 inch.
- H. Maximum Angular Movement: 15 degrees.
- I. Accessories: Control rods.
- J. Maximum Service Pressure and Temperature by Pipe Size:
 1. Pipe Sizes 3/4 to 2 Inch: 150 psi at 210 degrees F.
 2. Pipe Sizes 1-1/2 to 12 Inch: 150 psi at 250 degrees F.
 3. Pipe Sizes 14 to 24 Inch: 105 psi at 250 degrees F.

2.06 EXPANSION JOINTS - COMPENSATORS

- A. Manufacturers:
 1. Flex-Hose Co. Inc: www.flexhose.com/#sle.
 2. Mercer Rubber Company: www.mercer-rubber.com.
 3. Unisource Manufacturing, Inc; Series 416, Expansion Compensators: www.unisource-mfg.com/#sle.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Type: Two-ply 304 stainless steel bellows with carbon steel shroud.
- C. Maximum Working Pressure: 200 psi.

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- D. Maximum Working Temperature: 400 degrees F.
- E. Maximum Compression: 1/2 inch.
- F. Maximum Extension: 5/32 inch.
- G. End Connections: Female copper sweat.
- H. Application: Copper piping up to 3 inches in size or steel piping up to 4 inches in size.

2.07 EXPANSION JOINTS - STEEL WITH PACKED SLIDING SLEEVE

- A. Manufacturers:
 - 1. Mercer Rubber Company: www.mercer-rubber.com.
 - 2. Metraflex Company: www.metraflex.com.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Working Pressure and Temperature: Class 150.
- C. End Connections: Flanged.
- D. Size: Use pipe sized units.
- E. Application: Steel piping 2 inches and over.

2.08 EXPANSION JOINTS - HOSE AND BRAID

- A. Manufacturers:
 - 1. Flex-Hose Co. Inc; V-Loop: www.flexhose.com/#sle.
 - 2. Flex-Weld, Inc; Keflex Ke-Loop: www.kelcoind.com/#sle.
 - 3. The Metraflex Company; Metraloop: www.metraflex.com/#sle.
 - 4. Unisource Manufacturing, Inc; V-Loop: www.unisource-mfg.com/#sle.
- B. Maximum Allowable Motion: 2 inch in the x, y, and z planes with no thrust loads to the building structure.
- C. Maximum Working Pressure: 150 psi at 800 degrees F.
- D. 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. Provide necessary accessories including, but not limited to, swivel joints

2.09 ACCESSORIES

- A. Pipe Alignment Guides:
- B. Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inches travel.
- C. Swivel Joints:
 - 1. Fabricated steel body, double ball bearing race, field lubricated, with rubber (Buna-N) o-ring seals.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.
- C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.
- D. 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.
- E. 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.
- F. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.
- G. Substitute grooved piping for vibration isolated equipment instead of flexible connectors. Grooved piping need not be anchored.

END OF SECTION

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SECTION 22 0517 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

1.03 REFERENCE STANDARDS

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2024.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified this section.
 - 1. Minimum three years experience.
- C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.06 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.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

- A. Manufacturers:
 - 1. Flexicraft Industries; Pipe Wall Sleeve: www.flexicraft.com/#sle.
- B. Vertical Piping:
 - 1. Sleeve Length: 1 inch above finished floor.
 - 2. Provide sealant for watertight joint.
 - 3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
 - 4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.
- 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. Clearances:
 - 1. Provide allowance for insulated piping.
 - 2. Wall, Floor, Partitions, and Beam Flanges: 1 inch greater than external pipe diameter.

2.02 PIPE-SLEEVE SEALS

- A. Manufacturers:
 - 1. Advance Products & Systems, LLC; Innerlynx: www.apsonline.com/#sle.
 - 2. Flexicraft Industries; PipeSeal: www.flexicraft.com/#sle.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Modular Mechanical Sleeve-Seal:
 - 1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.

SECTION 22 0517 SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

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.
- C. 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.
- D. Pipe Sleeve Material:
1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.
 2. Masonry Structures: Sheet metal or fiber.
- E. Wall Sleeve: PVC material with waterstop collar, and nailer end-caps.
- F. Sleeve-Forming Disk: Non-conductive plastic-based material, 3 inch thick.
- G. Pipeline-Casing Seals:
1. Coated boltless casing-spacer for 4 inch carrier pipe.
 2. Coated boltless modular seal for 6 inch carrier pipe.
 3. Carbon steel band with risers for 12 inch carrier pipe.
 4. End Seals: 1/8 inch, pull-on type, rubber or synthetic rubber based.

PART 3 EXECUTION

3.01 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. Inserts:
1. Provide inserts for placement in concrete formwork.
 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
- E. Structural Considerations: Do not penetrate building structural members unless indicated.
- F. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
 2. Aboveground Piping:
 - a. Pack solid using mineral fiber complying with ASTM C592.
 - b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
 3. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- G. 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.
- H. 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.

SECTION 22 0517 SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

3.02 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 0523 GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Ball valves.
- B. Butterfly valves.
- C. Check valves.
- D. Specialty Valves
- E. Gas Service Ball Valves

1.02 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.

1.03 REFERENCE STANDARDS

- A. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2025.
- B. 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; 2025, with Errata.
- C. NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum
- D. NSF 372 - Drinking Water System Components - Lead Content; 2024.

1.04 SUBMITTALS

- A. See Section 01 3000 - 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.
- C. Certification of compliance with NSF/ANSI standards for potable water service, where applicable.

1.05 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.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

1.06 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.

SECTION 22 0523 GENERAL-DUTY VALVES FOR PLUMBING PIPING

- 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 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valves shall be suitable for intended service, pressure, and temperature conditions.
- C. Valve Sizes: Match upstream piping unless otherwise indicated.
- D. 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.

2.02

- A. General
 1. Full-port, quarter-turn, ball valves.
 2. Blowout-proof stem.
 3. PTFE seats and seals.
- B. Sizes 2 inches and smaller:
 1. Bronze or brass body.
 2. Threaded, solder, or press connections.
- C. Sizes 2-1/2 inches and larger:
 1. Bronze or ductile iron body.
 2. Flanged or grooved connections.
- D. Press-Fit Ball Valves (When Applicable):
 1. Valves shall be listed for press service and compatible with manufacturer-approved press tools.
 2. Installation personnel shall be trained by the press system manufacturer.

2.03 CHECK VALVES

- A. General:
 1. Valves shall be non-slam type suitable for intended service.
- B. Domestic Water Systems:
 1. Silent-type check valves shall be provided where installed in occupied spaces.

2.04 BUTTERFLY VALVES (WHEN APPLICABLE)

- A. Valves shall be resilient-seated butterfly valves suitable for isolation service.
- B. Butterfly valves are permitted for sizes 3 inches and larger unless noted otherwise.

2.05 SPECIALTY VALVES

- A. Thermostatic Mixing Valves:
 1. Provide where required by code or indicated on the Drawings.
- B. Pressure-Reducing Valves:
 1. Provide where system pressures exceed code or equipment limits.

2.06 GAS SERVICE BALL VALVES

- A. A 2-piece, brass gas ball valve to be installed as indicated on the plans. The valve must have PTFE seats, brass stem, ball and body. Pressure rating no less than 5psi WOG non-shock.

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.

SECTION 22 0523 GENERAL-DUTY VALVES FOR PLUMBING PIPING

- D. Should valve is determined to be defective, replace with new valve.

3.02 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- D. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Install ball valves for throttling, bypass, or manual flow control services.
- F. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.
- G. Provide spring loaded check valves on discharge of water pumps.
- H. Provide flow controls in water recirculating systems where indicated.

3.03 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Tag valves with unique identifiers corresponding to Drawings and valve schedules.
- C. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
- D. Install check valves where necessary to maintain direction of flow.
- E. Provide chainwheels on operators for valves 4 inch and larger where located 96 inches or more above finished floor, terminating 60 inches above finished floor.

3.04 TESTING

- A. Test valves as part of system testing in accordance with applicable codes.

END OF SECTION

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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. Anchors and fasteners.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).
- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2025.
- D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.
- E. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- G. 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; 2025.
- H. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- J. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- K. FM (AG) - FM Approval Guide; Current Edition.
- L. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- M. UL (DIR) - Online Certifications Directory; Current Edition.
- N. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components 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.

SECTION 22 0529 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 5. 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 3000.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for nonpenetrating rooftop supports.

1.06 QUALITY ASSURANCE

- A. Comply with applicable building code.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.

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 with a minimum safety factor of 1.5. 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. Fire Resistance: Provide hardware rated for 60 minutes resistance unless specifically indicated by the authority having jurisdiction.
- F. Materials for Metal Fabricated Supports:
 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.
- G. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.
 1. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 2. Outdoor, Damp, or Wet-Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

2.02 PREFABRICATED TRAPEZE-FRAMED SYSTEMS

- A. Prefabricated Trapeze-Framed Metal Strut Systems:
 1. 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.
 2. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
 3. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
 4. 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.

SECTION 22 0529 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

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 diameter.
 - b. Piping up to 1 inch: 1/4 inch diameter.
 - c. Piping larger than 1 inch: 3/8 inch diameter.
 - d. Trapeze Support for Multiple Pipes: 3/8 inch in length.
- C. Channel Nuts:
 1. 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. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
- B. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- C. 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. MSS SP-58 type 5, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
 2. Felt-Lined: Provide for uninsulated pipe to reduce noise and prevent static issues.
- C. Swivel Ring Hangers, Adjustable:
 1. MSS SP-58 type 10, epoxy-painted, zinc-colored.
 2. 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.
 3. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.
 4. Felt-Lined: Provide for uninsulated pipe to reduce noise and prevent static issues.
- D. Clevis Hangers, Adjustable:
 1. Copper Tube: MSS SP-58 type 1, epoxy-plated copper.
 2. Felt-Lined: MSS SP-58 type 1, zinc-plated, silicone-free carbon steel.
 3. Light-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.
 4. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.
- E. Nonmetallic Pipe Hangers:
 1. CPVC fabricated, snap-action hanger for pendant or sidewall applications.

2.06 PIPE CLAMPS

- A. Riser Clamps:
 1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
 2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
 3. UL (DIR) listed: Pipe sizes 1/2 to 8 inch.
- B. Extension Split Pipe Clamp:
 1. MSS SP-58 type 12, hinged split ring and yoke roller hanger with epoxy copper or plain finish.
 2. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
 3. Provide hanger rod and nuts of the same type and material for a given pipe run.
 4. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

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- C. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.
- D. Strut Clamps:
 - 1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.
 - 2. Cushioned Pipe or Tubing Strut Clamp: Provide strut clamp with thermoplastic elastomer cushion having dielectric strength of 670 V/mil.
 - 3. Service Temperature Range: Minus 65 to 275 degrees F.
- E. Insulation Coupling:
 - 1. Two bolt-type clamps designed for installation under insulation.
 - 2. Material: Carbon steel with epoxy copper or zinc finish.

2.07 PIPE ROLLERS AND ROLLER SUPPORTS

- A. MSS SP-58 type 43 based on required load, nonconductive and corrosion resistant.
- B. 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. Intermediate Anchors and Pipe Alignment Guides:
 - 1. Pipe Sizes 6 inch and Smaller: Minimum clearance of 0.16 inch.
 - 2. Pipe Size 8 inch: 0.625 inch U-bolt with double nuts providing minimum clearance of 0.28 inch.
 - 3. Pipe Size 10 inch: 0.75 inch U-bolt.
 - 4. Pipe Sizes 12 to 16 inch: 0.875 inch U-bolt.
 - 5. Pipe Sizes 18 to 30 inches: 1 inch U-bolt.
 - 6. Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.
- E. Pipe Alignment Guides:
 - 1. Pipe Sizes 8 inch and Smaller: Spider or sleeve type.
 - 2. Pipe Sizes 10 inch and Larger: Roller type.
- F. 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.
 - d. Service Temperature: Minus 40 to 178 degrees F.
 - e. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
- G. 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:
 - a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
 - b. Support From Below: MSS SP-58 types 35 through 38.
- H. 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.

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- 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 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, when tested in accordance with ASTM E96/E96M.
 - c. Minimum Thickness: 60 mil, 0.06 inch.

2.09 ANCHORS AND FASTENERS

- A. Manufacturers - Mechanical Anchors:
 - 1. Hilti, Inc: www.us.hilti.com/#sle.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Manufacturers - Powder-Actuated Fastening Systems:
 - 1. Hilti, Inc: www.us.hilti.com/#sle.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- C. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
- D. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
- E. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
- F. Hollow Masonry: Use toggle bolts.
- G. Hollow Stud Walls: Use toggle bolts.
- H. Steel: Use beam ceiling clamps, beam clamps, machine bolts, or welded threaded studs.
- I. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, plain, stainless steel, or zinc finish.
- J. Sheet Metal: Use sheet metal screws.
- K. Wood: Use wood screws.
- L. Plastic and lead anchors are not permitted.
- M. Powder-actuated fasteners are not permitted.
- N. Hammer-driven anchors and fasteners are not permitted.
- O. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.
- P. 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 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 anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

SECTION 22 0529 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

- 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. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- H. 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. Unless otherwise indicated, mount floor-mounted equipment on properly sized 4 inch high concrete pad constructed in accordance with Section 03 3000.
 - 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.
- J. Secure fasteners according to manufacturer's recommended torque settings.
- K. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - 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

SECTION 22 0548 VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vibration-isolated equipment support bases.
- B. Vibration isolators.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.

1.03 DEFINITIONS

- A. Plumbing Component: Where referenced in this section in regards to seismic controls, applies to any portion of the plumbing system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., piping).

1.04 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

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 3000.

1.06 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings - Vibration Isolation Systems:
 - 1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.
 - 2. Vibration-Isolated Equipment Support Bases: Include base weights, including concrete fill where applicable; indicate equipment mounting provisions.

1.07 QUALITY ASSURANCE

- A. Comply with applicable building code.

PART 2 PRODUCTS

2.01 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

2.02 VIBRATION ISOLATORS

- A. General Requirements:
 - 1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Secure fasteners according to manufacturer's recommended torque settings.
- D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

END OF SECTION

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PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe markers.
- D. Underground warning tape.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

PART 2 PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

- A. Nameplates:
 - 1. Heat exchangers, water heaters, and other heat transfer products.
 - 2. Control panels, transducers, and other related control equipment products.
 - 3. Pumps, tanks, filters, water treatment devices, and other plumbing equipment products.
- B. Tags:
 - 1. Piping: 3/4 inch diameter and smaller.
 - 2. Manual operated and automated control valves.
- C. Pipe Markers: 3/4 inch diameter and higher.

2.02 NAMEPLATES

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.pipemarker.com/#sle.
 - 2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 3. Seton Identification Products: www.seton.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Laminated piece with up to three lines of text.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/4 inch.
 - 3. Background Color: Black.

2.03 TAGS

- A. Manufacturers:
 - 1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
 - 2. Brady Corporation: www.bradycorp.com.
 - 3. Brimar Industries, Inc.: www.pipemarker.com.
 - 4. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 5. Seton Identification Products: www.seton.com.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Flexible: Vinyl with engraved black letters on light contrasting background color with up to three lines of text. Minimum tag size 1-1/2 inch in diameter.
- C. Metal: Brass, 19 gauge 1-1/2 inch in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.
- D. Valve Tag Chart: Typewritten 12-point letter size list in anodized aluminum frame.

2.04 PIPE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradycorp.com.
 - 2. Brimar Industries, Inc: www.pipemarker.com.
 - 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
 - 4. Seton Identification Products: www.seton.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Comply with ASME A13.1.
- C. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.

SECTION 22 0553 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

- D. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.
- E. Underground Flexible Marker: Bright-colored continuously printed ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.
- F. Identification Scheme, ASME A13.1:
 - 1. Primary: External Pipe Diameter, Uninsulated or Insulated.
 - 2. Secondary: Color scheme per fluid service.
 - a. Combustible Fluids: White text on brown background.
 - b. Fire Quenching Fluids: White text on red background.
 - c. Flammable and Oxidizing Fluids: Black text on yellow background.
 - d. Toxic and Corrosive Fluids: Black text on orange background.
 - e. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.
 - 3. Tertiary: Other Details.
 - a. Directional flow arrow.

2.05 UNDERGROUND WARNING TAPE

- A. Manufacturers:
 - 1. Brady Corporation: www.bradyid.com/#sle.
 - 2. Brimar Industries, Inc: www.brimar.com/#sle.
 - 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
 - 4. Seton Identification Products: www.seton.com/#sle.
- B. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- C. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil, 0.004 inch.
- D. Legend: Type of service, continuously repeated over full length of tape.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive identification products.

3.02 INSTALLATION

- A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags in clear view and align with axis of piping
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Apply ASME A13.1 Pipe Marking Rules:
 - 1. Place pipe marker adjacent to changes in direction.
 - 2. Place pipe marker adjacent each valve port and flange end.
 - 3. Place pipe marker at both sides of floor and wall penetrations.
 - 4. Place pipe marker every 25 to 50 feet interval of straight run.

END OF SECTION

SECTION 22 0719 PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flexible elastomeric cellular insulation.
- B. Glass fiber insulation.
- C. Weather barrier coatings.
- D. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 09 9123 - Interior Painting: Painting insulation jacket.

1.03 REFERENCE STANDARDS

- A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- C. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2024).
- D. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2024).
- E. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2025.
- F. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2025.
- G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- H. 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).
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- J. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- 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 3000 - 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 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 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, UL 723, ASTM E84, or UL 723.

2.02 GLASS FIBER INSULATION

- A. Manufacturers:

SECTION 22 0719 PLUMBING PIPING INSULATION

1. CertainTeed Corporation: www.certainteed.com.
 2. Johns Manville Corporation: www.jm.com.
 3. Knauf Insulation: www.knaufinsulation.com/#sle.
 4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
1. K Value: ASTM C177, 0.24 at 75 degrees F.
 2. Maximum Service Temperature: 850 degrees F.
 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 Value: ASTM C177, 0.23 at 75 degrees F.
 2. Maximum Service Temperature: 220 degrees F.
 3. Maximum Moisture Absorption: 0.2 percent by volume.
- D. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
1. K Value: ASTM C177, 0.24 at 75 degrees F.
 2. Maximum Service Temperature: 650 degrees F.
 3. Maximum Moisture Absorption: 0.2 percent by volume.
- E. 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.
- F. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- G. Vapor Barrier Lap Adhesive: Compatible with insulation.
- H. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
- I. Fibrous Glass Fabric:
1. Cloth: Untreated; 9 oz/sq yd weight.
 2. Blanket: 1.0 pcf density.
 3. Weave: 5 by 5.
- J. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd weight.
 2. Vinyl emulsion type acrylic, compatible with insulation, black color.
- K. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- L. Outdoor Breather Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- M. Insulating Cement: ASTM C449.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturers:
1. Aeroflex USA, Inc: www.aeroflexusa.com.
 2. Armacell LLC; AP Armaflex: www.armacell.us/#sle.
 3. K-Flex USA LLC: www.kflexusa.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
1. 'K' value: ASTM C177, 0.25 at 75 degrees F.
 2. Minimum Service Temperature: Minus 40 degrees F.
 3. Maximum Service Temperature: 220 degrees F.
 4. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

SECTION 22 0719 PLUMBING PIPING INSULATION

2.04 WEATHER BARRIER COATINGS

- A. Weather-Resistive Barrier Coating: Fire-resistant, UV resistant, water-based mastic for use over closed cell polyethylene and polyurethane foam insulation; applied with glass fiber or synthetic reinforcing mesh.
 - 1. 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.
 - 2. Water Vapor Permeance: Greater than 1.0 perm in accordance with ASTM E96/E96M.
 - 3. Resistance to Fungal Growth: No growth when tested in accordance with ASTM D5590.
 - 4. Color: As selected by Architect.

2.05 JACKETING AND ACCESSORIES

- A. PVC Plastic Jacket:
 - 1. Manufacturers:
 - a. Johns Manville Corporation: www.jm.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
 - 2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F.
 - b. Maximum Service Temperature: 150 degrees F.
 - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil, 0.010 inch.
 - e. Connections: Brush on welding adhesive.
 - 3. Covering Adhesive Mastic: Compatible with insulation.
- B. Aluminum Jacket:
 - 1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
 - 2. Thickness: 0.016 inch sheet.
 - 3. Finish: Smooth.
 - 4. Joining: Longitudinal slip joints and 2 inch laps.
 - 5. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
 - 6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- H. Glass fiber insulated pipes conveying fluids above ambient temperature:

SECTION 22 0719 PLUMBING PIPING INSULATION

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- I. Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 3. Insert Location: Between support shield and piping and under the finish jacket.
 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.
- K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting.
- L. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
- M. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULES

- A. Plumbing Systems:
1. Domestic Cold Water (Copper Piping):
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: <4 inch.
 - 2) Thickness: 1 inch.
 2. Domestic Cold Water (PEX Piping):
 - a. Flexible Elastomeric Insulation:
 - 1) Pipe Size Range: <4 inch.
 - 2) Thickness: 1 inch.

END OF SECTION

SECTION 22 1319 SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Floor drains.

1.02 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Plastic Sanitary Waste Piping Specialties: Provide plastic products that comply with NSF 14.
- B. Source Limitations: Furnish drains and sanitary waste piping specialties of same kind by same manufacturer.

2.02 FLOOR DRAINS

- A. Cast Iron Floor Drains:
 - 1. Manufacturers:
 - a. MIFAB, Inc: www.mifab.com/#sle.
 - b. Zurn Industries, LLC: www.zurn.com/#sle.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
 - 2. Assembly: ASME A112.6.3.
 - 3. Body: Lacquered cast iron with anchor flange and membrane clamping collar with weepholes.
 - 4. Strainer: Adjustable, removable, with vandal-proof screws.
 - 5. Accessories:
 - a. Trap seal insert.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Maintain continuity of waterproofing membranes. Secure waterproofing membranes to drain clamping collars and bonding flanges.
- C. Install drains so strainers and grates are level and are at design elevation.

END OF SECTION

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SECTION 22 1005 PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sanitary waste piping, buried within 5 feet of building.
- B. Sanitary waste piping, above grade.
- C. Domestic water piping, above grade.
- D. Pipe, pipe fittings, valves, regulators, and connections for piping systems.
 - 1. Natural gas piping, above grade.
 - 2. Pipe hangers and supports.

1.02 RELATED REQUIREMENTS

- A. Section 09 9113 - Exterior Painting.
- B. Section 22 0516 - Expansion Fittings and Loops for Plumbing Piping.
- C. Section 22 0548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- D. Section 22 0553 - Identification for Plumbing Piping and Equipment.
- E. Section 22 0719 - Plumbing Piping Insulation.

1.03 REFERENCE STANDARDS

- A. ANSI LC 1/CSA 6.26 - Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing; 2023.
- B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- E. ASME B16.51 - Copper and Copper Alloy Press-Connect Pressure Fittings; 2021.
- F. ASME B31.1 - Power Piping; 2024.
- G. ASME B31.9 - Building Services Piping; 2025.
- H. 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; 2025, with Errata.
- I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- J. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2025.
- K. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- L. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2025.
- M. ASTM B32 - Standard Specification for Solder Metal; 2020.
- N. ASTM B813 - Standard Specification for Water Flushable Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2024.
- O. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2023.
- P. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2026.
- Q. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020 (Reapproved 2024).
- R. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2025.
- S. 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 (Reapproved 2024).
- T. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2024, with Editorial Revision (2025).

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- U. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- V. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.
- W. 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.
- X. IAPMO (UPC) - Uniform Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- Y. IAPMO/ANSI/CAN Z1117 - Standard for Press Connections; 2022.
- Z. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- AA. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).
- BB. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).
- CC. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).
- DD. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.
- EE. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- FF. NFPA 54 - National Fuel Gas Code; 2024.
- GG. NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum
- HH. NSF 372 - Drinking Water System Components - Lead Content; 2024.

1.04 SUBMITTALS

- A. See Section 01 3000 - 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.
- C. Certification that press-fit systems are installed by manufacturer-trained personnel using approved tools.
- D. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.
- E. Project Record Documents: Record actual locations of valves.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements for additional provisions.
 - 2. Valve Repacking Kits: One for each type and size of valve.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.
- E. Press-Fit Systems: Installation personnel shall be trained and certified by the manufacturer of the press system being installed.
- F. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.

SECTION 22 1005 PLUMBING PIPING

- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 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, solder, and flux (if used), complying with NSF 61 and NSF 372; label pipe and fittings.

2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
- C. PVC Pipe: ASTM D2665, Schedule 40.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.
 - 3. Foam core piping not allowed.

2.03 SANITARY WASTE PIPING, ABOVE GRADE

- A. 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.

2.04 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
 - 2. Joints: ASTM B32 solder.
 - 3. Mechanical Press Sealed Fittings: ASME B16.51 or IAPMO/ANSI/CAN Z1117, ICC (IPC), and IAPMO (UPC) approved, NSF 61 and NSF 372 certified, with EPDM seals.

2.05 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
 - 2. Joints: Threaded or welded to ASME B31.1.
- B. Flexible Gas Piping:
 - 1. Corrugated Stainless Steel Tubing: Comply with ANSI LC 1/CSA 6.26.
 - 2. Comply with ASTM E84.
 - 3. Fittings: Provided by piping system manufacturer.
 - 4. Bonding of CSST systems shall comply with NFPA 54 and manufacturer requirements.

2.06 PIPE HANGERS AND SUPPORTS

- A. 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.
 - a. Cold and Hot Pipe Sizes 6 inch and Larger: Double hangers.
 - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 - 4. Vertical Pipe Support: Steel riser clamp.
 - 5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
 - 6. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:

SECTION 22 1005 PLUMBING PIPING

- a. Bases: High-density polypropylene.
 - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - c. Steel Components: Stainless steel or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
 - d. Attachment and Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion-resistant material.
 - e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.
 - f. Manufacturers:
 - 1) PHP Systems/Design: www.phpsd.com.
 - 2) Miro, Inc.: www.miroind.com.
 - 3) Substitutions: See Section 01 6000 - Product Requirements.
- B. Plumbing Piping - Drain, Waste, and Vent:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
 2. Hangers for Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
 3. Wall Support for Pipe Sizes to 3 inch: Cast iron hook.
 4. Wall Support for Pipe Sizes 4 inch and Over: Welded steel bracket and wrought steel clamp.
 5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
 2. Hangers for Cold Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
 3. Hangers for Hot Pipe Sizes 2 to 4 inch: Carbon steel, adjustable, clevis.
 4. Hangers for Hot Pipe Sizes 6 inch and Larger: Adjustable steel yoke, cast iron pipe roll, double hanger.
 5. Wall Support for Pipe Sizes Up to 3 inch: Cast iron hook.
 6. Wall Support for Pipe Sizes 4 inch and Larger: Welded steel bracket and wrought steel clamp.
 7. Wall Support for Hot Pipe Sizes 6 inch and Larger: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
 8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 9. Floor Support for Hot Pipe Sizes to 4 inch: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
 10. Floor Support for Hot Pipe Sizes 6 inch and Larger: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
 11. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Comply with ICC-ES AC193.
 2. Masonry Wedge Expansion Anchors: Comply with ICC-ES AC01.
 3. Concrete Screw Type Anchors: Comply with ICC-ES AC193.
 4. Masonry Screw Type Anchors: Comply with ICC-ES AC106.
 5. Concrete Adhesive Type Anchors: Comply with ICC-ES AC308.
 6. Other Types: As required.
 7. Manufacturers:
 - a. Powers Fasteners, Inc.: www.powers.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

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.

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- 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 0516.
- 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. Establish elevations of buried piping outside the building to ensure not less than 4 ft of cover.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- K. Provide support for utility meters in accordance with requirements of utility companies.
- L. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
 - 1. See Section 09 9113 for painting of exterior plumbing systems and components.
- M. Install bell and spigot pipe with bell end upstream.
- N. Install water piping to ASME B31.9.
- O. 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.
- P. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- Q. Sleeve pipes passing through partitions, walls, and floors.
- R. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- S. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Support horizontal piping as indicated.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Place hangers within 12 inches of each horizontal elbow.
 - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 8. Provide copper plated hangers and supports for copper piping.
 - 9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

SECTION 22 1005 PLUMBING PIPING

10. Provide hangers adjacent to motor-driven equipment with vibration isolation; see Section 22 0548.
 11. Support cast iron drainage piping at every joint.
- T. 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.

3.04 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

3.05 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.06 FIELD TESTS AND INSPECTIONS

- A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction.
- B. Gas Distribution Systems:
 1. Test Preparation: Close each appliance valve or disconnect and cap each connected appliance.
 2. Test gas piping with air or inert gas at not less than 1.5 times operating pressure for a minimum of 30 minutes.
- C. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.07 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A.

3.08 SCHEDULES

- A. Pipe Hanger Spacing:
 1. Metal Piping:
 - a. Pipe Size: 1/2 inch to 1-1/4 inch:
 - 1) Maximum Hanger Spacing: 6.5 ft.
 - 2) Hanger Rod Diameter: 3/8 inches.
 - b. Pipe Size: 1-1/2 inch to 2 inch:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 3/8 inch.
 - c. Pipe Size: 2-1/2 inch to 3 inch:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 1/2 inch.
 - d. Pipe Size: 4 inch to 6 inch:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 5/8 inch.
 2. Plastic Piping:
 - a. All Sizes:
 - 1) Maximum Hanger Spacing: 6 ft.
 - 2) Hanger Rod Diameter: 3/8 inch.

END OF SECTION

PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Ice maker outlet boxes.
- B. Floor drain trap seals.
- C. Trap seal protection.

1.02 RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping.
- B. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2023.
- B. ASSE 1072 - Performance Requirements for Barrier Type Trap Seal Protection for Floor Drains; 2020.
- C. NSF 61 - Drinking Water System Components - Health Effects; 2025, with Addendum
- D. NSF 372 - Drinking Water System Components - Lead Content; 2024.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.06 DELIVERY, STORAGE, AND 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.

2.02 ICE MAKER OUTLET BOXES

- A. Manufacturers:
 - 1. IPS Corporation/Water-Tite: www.ipscorp.com.
 - 2. Oatey Supply Chain Services, Inc: www.oatey.com/#sle.
 - 3. Zurn Industries, LLC: www.zurn.com.
- B. Description: Plastic preformed square or round rough-in box with brass quarter-turn ball valve, and slip-in finishing cover.
- C. Provide fire-rated outlet-box assembly for installation in 1- and 2-hour rated walls.
- D. Accessories:
 - 1. Support brackets for installation between framing studs.

2.03 FLOOR DRAIN TRAP SEALS

- A. Manufacturers:
 - 1. Green Drains; GD4: www.greendrains.com/#sle.
 - 2. MIFAB, Inc: www.mifab.com/#sle.
 - 3. Sure Seal: www.thesureseal.com..
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Push-fit EPDM or silicone fitting with a one-way membrane.
- C. Standard: ASSE 1072.
- D. Size: 2 inch (50 mm), 3 inch (75 mm), 3-1/2 inch (89 mm), or 4 inch (100 mm).

SECTION 22 1006 PLUMBING PIPING SPECIALTIES

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. Pipe relief from backflow preventer to nearest drain.
- G. Pressure test sanitary sewer piping prior to the installation of air admittance valves.

END OF SECTION

SECTION 23 0513 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General construction and requirements.
- B. Single phase electric motors.
- C. Three phase electric motors.

1.02 RELATED REQUIREMENTS

- A. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. 10 CFR 431 - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.
- B. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015, with Errata (2026).
- C. ABMA STD 11 - Load Ratings and Fatigue Life for Roller Bearings; 2014 (Reaffirmed 2020).
- D. NEMA MG 00001 - Motors and Generators; 2024.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

1.05 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Products Requiring Electrical Connection: Listed and classified by testing firm acceptable to the Authority Having Jurisdiction as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for motors larger than 20 horsepower.

1.08 SUMMARY

- A. This Section includes minimum requirements for electric motors furnished integral with HVAC equipment.
- B. Motors shall be provided by the equipment manufacturer unless explicitly indicated otherwise.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Motors shall be:
 - 1. Continuous duty rated
 - 2. Designed for operation in a 104°F (40°C) ambient environment
 - 3. Rated and constructed in accordance with NEMA MG-1
- B. Construction:
 - 1. Open drip-proof type where located in dry, indoor environments
 - 2. Totally Enclosed Fan-Cooled (TEFC) or equivalent where exposed to moisture, dirt, or outdoor conditions
- C. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

2.02 VARIABLE FREQUENCY DRIVE APPLICATIONS

- A. Motors serving equipment controlled by VFDs shall be inverter-duty rated in accordance with NEMA MG 00001, Part 31.

SECTION 23 0513 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

- B. Motors shall be suitable for operation across the full speed range required by the equipment manufacturer.

2.03 THREE-PHASE MOTORS

- A. Motors shall be NEMA Design B squirrel-cage induction motors unless otherwise required by the equipment manufacturer.
- B. Bearings:
 - 1. Anti-friction ball bearings
 - 2. Minimum ABMA STD 11 L-10 life of 20,000 hours at rated load
- C. Motors 50 HP and larger shall be provided with embedded winding temperature sensors for connection to motor protection devices furnished under Division 26.

2.04 EFFICIENCY

- A. Motors shall comply with the minimum efficiency requirements of 10 CFR 431.
- B. Motor efficiency and power factor shall be indicated on equipment submittals.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check line voltage, frequency and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 23 0516 EXPANSION FITTINGS AND LOOPS FOR HVAC 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 REFERENCE STANDARDS

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2025.
- C. ASTM A536 - Standard Specification for Ductile Iron Castings; 2024.
- D. EJMA (STDS) - EJMA Standards; Tenth Edition.

1.03 SUBMITTALS

- A. See Section 01 3000 - 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 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.
- C. Delegated Design Submittal: Drawings show design intent for expansion, detailed design shall be delegated-design submittal for installing contractor. For chilled water, hot water, steam, steam condensate, refrigerant, and condenser water piping systems, design and detail expansion compensation design per ASHRAE (FUND).
 - 1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops and swing connections.
 - 2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
 - 3. Alignment Guide Details: Detail field assembly and attachment to building structure.
 - 4. Schedule: Indicate type, manufacturer's number, size material, pressure rating, end connections and location for each expansion joint.
- D. Manufacturer's Instructions: Indicate manufacturer's installation instructions, special procedures, and external controls.
- E. Maintenance Data: Include adjustment instructions.

PART 2 PRODUCTS

2.01 FLEXIBLE PIPE CONNECTORS - STEEL PIPING

- A. Manufacturers:
 - 1. The Metraflex Company: www.metroflex.com/#sle.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Inner Hose: Stainless Steel.
- C. Exterior Sleeve: Single braided, stainless steel.
- D. Pressure Rating: 125 psi up to 12 inch.
- E. End Connections: Flanged.
- F. Size: Use pipe sized units.
- G. Maximum offset: 3/4 inch on each side of installed center line.

2.02 FLEXIBLE PIPE CONNECTORS - COPPER PIPING

- A. Manufacturers:
 - 1. Metraflex Company: www.metroflex.com.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Inner Hose: Bronze.
- C. Exterior Sleeve: Braided bronze.

SECTION 23 0516 EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

- D. Pressure Rating: 125 psi up to 2 inch.
- E. End Connections: Flanged.
- F. Size: Use pipe sized units.
- G. Maximum offset: 3/4 inch on each side of installed center line.
- H. Application: Copper piping.

2.03 EXPANSION JOINTS - STAINLESS STEEL BELLOWS TYPE

- A. Manufacturers:
 - 1. Metraflex Company: www.metroflex.com.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Pressure Rating: 125 psi and 400 degrees F.
- C. Maximum Compression: 1-3/4 inches.
- D. Maximum Extension: 1/4 inch.
- E. End Connections: Externally pressurized with flanged ends.
- F. Size: Use pipe sized units.
- G. Application: Steel piping 3 inches and under.

2.04 EXPANSION JOINTS - EXTERNAL RING CONTROLLED STAINLESS STEEL BELLOWS TYPE

- A. Manufacturers:
 - 1. Metraflex Company: www.metroflex.com.
 - 2. Flexonics: <http://flexonics.com>.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Pressure Rating: 125 psi and 400 degrees F.
- C. Maximum Compression: 15/16 inch.
- D. Maximum Extension: 5/16 inch.
- E. Maximum Offset: 1/8 inch.
- F. End Connections: Flanged.
- G. Size: Use pipe sized units.
- H. Accessories: Internal flow liner and external shroud.
- I. Application: Steel piping over 2 inches.

2.05 EXPANSION JOINTS - DOUBLE SPHERE, FLEXIBLE COMPENSATOR

- A. Manufacturers:
 - 1. Metraflex Company: www.metroflex.com.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Maximum Compression: 1/2 inch.
- C. Maximum Elongation: 3/8 inch.
- D. Maximum Offset: 3/8 inch.
- E. Maximum Angular Movement: 15 degrees.
- F. Accessories: Control rods.

2.06 EXPANSION JOINTS - TWO-PLY BRONZE BELLOWS TYPE

- A. Manufacturers:
 - 1. Metraflex Company: www.metroflex.com.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Construction: Bronze with anti-torque device, limit stops, internal guides.
- C. Pressure Rating: 125 psi and 400 degrees F.
- D. Maximum Compression: 1-3/4 inches.
- E. Maximum Extension: 1/4 inch.
- F. End Connections: Soldered.
- G. Size: Use pipe sized units.

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H. Application: Copper piping.

2.07 EXPANSION JOINTS - COMPENSATORS

A. Manufacturers:

1. Metraflex Company: www.metroflex.com.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Type: Two-ply 304 stainless steel bellows with carbon steel shroud.

C. Maximum Working Pressure: 200 psi.

D. Maximum Working Temperatures: 400 degrees F.

E. Maximum Compression: 1/2 inch.

F. Maximum Extension: 5/32 inch.

G. End Connections: Female copper sweat.

H. Application: Copper piping up to 3 inches in size or steel piping up to 4 inches in size.

2.08 ACCESSORIES

A. Pipe Alignment Guides:

1. Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inches travel.

B. Engineered Riser Anchor Clamps:

1. Manufacturers:

- a. The Metraflex Company; Engineered Riser Anchor Clamp: www.metroflex.com/#sle.
- b. Substitutions: See Section 01 6000 - Product Requirements.

2. Applications:

- a. Provide one clamp above and one clamp below the slab to anchor pipe.
 - 1) Coordinate with the structural engineer to determine the maximum thrust loading calculated for the slab or floor structure. Use the maximum thrust loading calculations to verify the clamps will be a safety factor of one less than the maximum loading of clamp per the manufacturer's instructions.

3. Provide two piece, ductile iron in compliance with ASTM A536. Use with metal pipes with an outer diameter of 2.5 inches to 8 inches.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.

C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.

D. 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.

E. Anchor pipe to building structure where required. 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.

F. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

G. Steam Flexible Expansion Loop with Stainless Steel Hose Pressure Ratings:

1. Install and guide per manufacturers' installation instructions and Mechanical Contractors Association of America "Guidelines for Quality Piping Installations".
2. Flexible hose expansion loop return fitting shall be supported to allow movement.

END OF SECTION

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SECTION 23 0517 SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe sleeves.
- B. Pipe-sleeve seals.

1.02 RELATED REQUIREMENTS

- A. Section 23 0553 - Identification for HVAC Piping and Equipment: Piping identification.
- B. Section 23 0719 - HVAC 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); 2024.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- 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.

1.06 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.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

- A. Manufacturers:
 - 1. Flexicraft Industries; Pipe Wall Sleeve: www.flexicraft.com.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Vertical Piping:
 - 1. Sleeve Length: 1 inch above finished floor.
 - 2. Provide sealant for watertight joint.
 - 3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
 - 4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.
- C. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- D. 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.
- E. Clearances:
 - 1. Provide allowance for insulated piping.
 - 2. Wall, Floor, Partitions, and Beam Flanges: 1 inch greater than external pipe diameter.

2.02 PIPE-SLEEVE SEALS

- A. Manufacturers:
 - 1. Flexicraft Industries; PipeSeal: www.flexicraft.com/#sle.
- B. Modular Mechanical Sleeve-Seal:

SECTION 23 0517 SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

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.
- C. Sealing Compounds:
1. Provide packing and sealing compound to fill pipe to sleeve thickness.
 2. Combined packing and seal compound is to match partition fire-resistance hourly rating.
- D. Pipe Sleeve Material:
1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.
 2. Masonry Structures: Sheet metal or fiber.
- E. Wall Sleeve: PVC material with waterstop collar, and nailer end-caps.
- F. Sleeve-Forming Disk: Non-conductive plastic-based material, 3 inch thick.
- G. Pipeline-Casing Seals:
1. End Seals: 1/8 inch, pull-on type, rubber or synthetic rubber based.

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. Inserts:
1. Provide inserts for placement in concrete formwork.
 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- E. Structural Considerations:
1. Do not penetrate building structural members unless indicated.
- F. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
 2. Aboveground Piping:
 - a. Pack solid using mineral fiber in compliance with ASTM C592.
 - b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
 3. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- G. 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.

SECTION 23 0517 SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

5. Tighten bolting for a water-tight seal.
 6. Install in accordance with manufacturer's recommendations.
- H. 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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PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment components.

1.02 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).
- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2025.
- D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.
- E. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- G. 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; 2025.
- H. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- J. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- K. FM (AG) - FM Approval Guide; Current Edition.
- L. MFMA-4 - Metal Framing Standards Publication; 2004.
- M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.
- N. UL (DIR) - Online Certifications Directory; Current Edition.
- O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for nonpenetrating rooftop supports.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. 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.

SECTION 23 0529 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Prefabricated Trapeze-Framed Metal Strut Systems:
1. Manufacturers:
 - a. ABB Installation Products: electrification.us.abb.com/#sle.
 - b. B-Line, a brand of Eaton Corporation: www.eaton.com/#sle.
 - c. Elgen Manufacturing Company, Inc: www.elgenmfg.com/#sle.
 - d. Gripple, Inc; Fast Track - Standard: www.gripple.com/#sle.
 - e. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
 - f. Substitutions: See Section 01 6000 - Product Requirements.
 2. MFMA-4 compliant, pre-fabricated, MSS SP-58 type 59 continuous-slot metal strut channel with associated tracks, fittings, and related accessories.
 3. Strut Channel or Bracket Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
 4. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
 5. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.
- C. Strut Channels:
1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or HVAC 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.
- D. Channel Nuts:
1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring.
- E. Hanger Rods:
1. Threaded zinc-plated steel unless otherwise indicated.
 2. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch diameter.
 - b. Piping up to 1 inch: 1/4 inch diameter.
 - c. Piping larger than 1 inch: 3/8 inch diameter.
 - d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.
- F. Steel Cable:
1. Manufacturers:
 - a. Ductmate Industries, Inc, a DMI Company; Clutcher Cable Hanging System: www.ductmate.com/#sle.
 - b. Elgen Manufacturing Company, Inc: www.elgenmfg.com/#sle.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
- G. Cable Hanging System Kits:
1. Manufacturers:
 - a. B-Line, a brand of Eaton Corporation: www.eaton.com/#sle.
 - b. Ductmate Industries, Inc: ductmate.com/#sle.
 - c. Gripple, Inc: www.gripple.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
 2. Provide cable-wire in bulk or precut lengths with respective cable hangers as required to hold minimum weight of 120 lb.

SECTION 23 0529 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

3. Accessories: Provide brackets, clip or c-clip hangers, covers, and y-hook hangers.
- H. Thermal Insulated Pipe Supports:
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. Pipe supports to be provided for nominally sized, 1/2 to 30 inch iron pipes.
 - d. Insulation inserts to consist of rigid polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.
 2. PVC Jacket:
 - a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
 - b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
 - c. Thickness: 60 mil.
 3. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation.
- I. 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:
 - a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
 - b. Support From Below: MSS SP-58 Types 35 through 38.
 3. Operating Temperatures from 122 to 446 degrees F:
 - a. Overhead Support: MSS SP-58 Type 1 or 3 through 12, with appropriate saddle of MSS SP-58 Type 40 for insulated pipe.
 - b. Roller Support: MSS SP-58 Types 41 or 43 through 46, with appropriate saddle of MSS SP-58 Type 39 for insulated pipe.
 - c. Sliding Support: MSS SP-58 Types 35 through 38.
- J. Roller Chairs:
1. MSS SP-58 type 43 based on required load, nonconductive and corrosion resistant.
 2. Steel Yoke Type: MSS SP-58 type 44, vertically adjustable, nonconductive, and corrosion resistant.
 3. Material: Zinc plated ASTM A36/A36M carbon steel or ASTM A47/A47M malleable iron.
- K. Pipe 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.
 3. For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.
- L. Beam Clamps:
1. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
 2. Beam C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.
 3. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).
 4. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.
 5. Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with plain finish.
 6. FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plain finish,
 7. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
 8. 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.

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- M. Riser Clamps:
1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
 2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
 3. Medium Split Horizontal Pipe Clamp: MSS SP-58 type 4, carbon steel or stainless steel with epoxy plated, plain, stainless steel, or zinc plated finish.
 4. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.
 5. UL (DIR) listed: Pipe sizes 1/2 to 8 inch.
- N. U-Bolts:
1. MSS SP-58 Type 24, carbon steel u-bolt for pipe support or anchoring.
- O. Strut Clamps:
1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.
 2. Cushioned Pipe or Tubing Strut Clamp: Provide strut clamp with thermoplastic elastomer cushion having dielectric strength of 670 V/mil.
 3. Service Temperature Range: Minus 65 to 275 degrees F.
- P. Insulation Clamps:
1. Two bolt-type clamps designed for installation under insulation.
 2. Material: Carbon steel with epoxy copper or zinc finish.
- Q. Pipe Hangers:
1. Split Ring Hangers:
 - a. Provide hinged split ring and yoke roller hanger with epoxy copper or plain finish.
 - b. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
 - c. Provide hanger rod and nuts of the same type and material for a given pipe run.
 - d. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
 2. Swivel Ring Hangers, Adjustable:
 - a. MSS SP-58 Type 10, epoxy-painted, zinc-colored.
 - b. 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.
 - c. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.
 - d. Felt-Lining: Provide for uninsulated pipe to reduce noise and prevent static issues.
 3. Clevis Hangers, Adjustable:
 - a. Copper Tube: MSS SP-58 Type 1, epoxy-plated copper.
 - b. Felt-Lined: MSS SP-58 Type 1, zinc-plated, silicone-free carbon steel.
 - c. Light-Duty: MSS SP-58 Type 1, zinc-colored, epoxy plated.
 - d. Standard-Duty: MSS SP-58 Type 1, zinc-colored, epoxy plated.
 - e. UL (DIR) listed: Pipe sizes 2-1/2 to 8 inch.
- R. Intermediate Pipe Guides:
1. Pipe Diameter 6 inch and Smaller: Provide minimum clearance of 0.16 inch.
 2. Pipe Sizes 8 inch: 0.625 inch U-bolt with double nuts providing minimum clearance of 0.28 inch.
 3. Pipe Size 10 inch: 0.75 inch U-bolt.
 4. Pipe Sizes 12 to 16 inch: 0.875 inch U-bolt.
 5. Pipe Sizes 18 to 30 inch: 1 inch U-bolt.
 6. Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.
- S. 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.
- T. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. Manufacturers:
 - a. Anvil International; H-Block: www.anvilintl.com/#sle.
 - b. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.

SECTION 23 0529 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

- c. Substitutions: See Section 01 6000 - Product Requirements.
 - 2. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
 - 3. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - 4. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
 - 5. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
- U. 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.
 - d. Minimum Service Temperature: Minus 40 degrees F.
 - e. Maximum Service Temperature: 178 degrees F.
 - f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
- V. Anchors and Fasteners:
- 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 - 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 - 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 - 4. Hollow Masonry: Use toggle bolts.
 - 5. Hollow Stud Walls: Use toggle bolts.
 - 6. Steel: Use beam-ceiling clamps, beam clamps, machine bolts, or welded threaded studs.
 - 7. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, plain, stainless steel, or zinc finish.
 - 8. Sheet Metal: Use sheet metal screws.
 - 9. Wood: Use wood screws.
 - 10. Plastic and lead anchors are not permitted.
 - 11. Powder-actuated fasteners are not permitted.
 - 12. Hammer-driven anchors and fasteners are not permitted.
 - 13. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
- W. Pipe Installation Accessories:
- 1. Thermal Insulated, Surface-Mounted Pipe Supports:
 - a. Material: Carbon steel with epoxy copper or zinc finish.
 - b. Weather and UV light resistant foam, plastic, or rubber material with built-in strut.
Maximum Load: 50 lb for single pipe or multiple landed on top strut.

END OF SECTION

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PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vibration isolation requirements.
- B. Vibration-isolated equipment support bases.
- C. Vibration isolators.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
 - 1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.

1.05 QUALITY ASSURANCE

- A. Comply with applicable building code.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

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 HVAC equipment and/or HVAC 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: As indicated on drawings.
- E. Piping Isolation:
 - 1. Provide vibration isolators for piping supports:
 - a. Located in equipment rooms.
 - b. Located within 50 feet of connected vibration-isolated equipment and pressure-regulating valve (PRV) stations.
 - 2. Minimum Static Deflection:
 - a. First Three Supports Closest to Isolated Equipment: Same as static deflection of equipment; maximum of 2 inch deflection required.
 - b. Remainder of Supports: 0.75 inch deflection unless otherwise indicated.
 - 3. Suspended Piping, Nonseismic Applications: Use resilient material isolator hangers, spring isolator hangers, or combination resilient material/spring isolator hangers.
 - 4. Floor-Mounted Piping, Nonseismic Applications: Use open (unhoused) spring isolators.
 - 5. Use modular seal or approved resilient material where vibration-isolated piping penetrates building elements (e.g., walls, floors) arranged to prevent vibration transmission to structure.

2.02 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

- A. Manufacturers:
 - 1. Vibration-Isolated Equipment Support Bases:
 - a. Kinetics Noise Control, Inc: www.kineticsnoise.com.
 - b. Mason Industries: www.mason-ind.com.
 - c. Vibro-Acoustics: www.vibro-acoustics.com/#sle.

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- d. Substitutions: See Section 01 6000 - Product Requirements.
- B. Vibration-Isolated Structural Steel Bases:
 - 1. Description: Engineered structural steel frames with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.
- C. Vibration-Isolated Concrete Inertia Bases:
 - 1. Description: Concrete-filled engineered steel forms with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.
 - 2. Minimum Base Depth: 6 inches.
 - 3. Minimum Base Mass (Including Concrete): 1.5 times weight of supported equipment.
 - 4. Concrete Reinforcement: Welded or tied reinforcing bars running both ways in a single layer.
 - 5. Concrete: Filled on site with minimum 3000 psi concrete in accordance with Section 03 3000.

2.03 VIBRATION ISOLATORS

- A. Manufacturers:
 - 1. Vibration Isolators:
 - a. Kinetics Noise Control, Inc: www.kineticsnoise.com.
 - b. Mason Industries: www.mason-ind.com.
 - c. Vibro-Acoustics: www.vibro-acoustics.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- B. General Requirements:
 - 1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
 - 2. Spring Elements for Spring Isolators:
 - a. Color code or otherwise identify springs to indicate load capacity.
 - b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
 - c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
 - d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
 - e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
 - f. Selected to function without undue stress or overloading.
- C. Vibration Isolators for Nonseismic Applications:
 - 1. Resilient Material Isolator Pads:
 - a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material.
 - b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch thickness.
 - c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.
 - 2. Resilient Material Isolator Mounts, Nonseismic:
 - a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material; fail-safe type.
 - 3. Open (Unhoused) Spring Isolators:
 - a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) without a housing.
 - b. Bottom Load Plate: Nonskid, molded, elastomeric isolator material or steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
 - c. Furnished with integral leveling device for positioning and securing supported equipment.
 - 4. Housed Spring Isolators:
 - a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing.

SECTION 23 0548 VIBRATION AND SEISMIC CONTROLS FOR HVAC

- b. Furnished with integral elastomeric snubbing elements, nonadjustable type, for limiting equipment movement and preventing metal-to-metal contact between housing elements.
 - c. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
 - d. Furnished with integral leveling device for positioning and securing supported equipment.
5. Restrained Spring Isolators, Nonseismic:
- a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop.
 - b. Bottom Load Plate: Steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
 - c. Furnished with integral leveling device for positioning and securing supported equipment.
 - d. Provides constant free and operating height.
6. Resilient Material Isolator Hangers, Nonseismic:
- a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the lower hanger rod connection.
7. Spring Isolator Hangers, Nonseismic:
- a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
 - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
8. Combination Resilient Material/Spring Isolator Hangers, Nonseismic:
- a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the upper hanger rod connection.
 - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
9. Thrust Restraints:
- a. Description: Assembly utilizing free-standing, laterally stable steel spring designed for resisting horizontal motion due to thrust (e.g., air pressure from a fan), and intended for installation in pairs.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.
- 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 anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Secure fasteners according to manufacturer's recommended torque settings.
- D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
- E. Vibration Isolation Systems:
 1. Vibration-Isolated Equipment Support Bases:
 - a. Provide specified minimum clearance beneath base.
 2. Spring Isolators:
 - a. Position equipment at operating height; provide temporary blocking as required.

SECTION 23 0548 VIBRATION AND SEISMIC CONTROLS FOR HVAC

- b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
- c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
3. Isolator Hangers:
 - a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
 - b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
4. Thrust Restraints:
 - a. Adjust restraint movement under normal operating static pressure.
5. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
6. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
7. Adjust isolators to be free of isolation short circuits during normal operation.
8. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect vibration isolation and/or seismic control components for damage and defects.
- C. Vibration Isolation Systems:
 1. Verify isolator static deflections.
 2. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.
- D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Adhesive-backed duct markers.
- D. Stencils.
- E. Pipe markers.

1.02 RELATED REQUIREMENTS

- A. Section 09 9123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2025.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Brady Corporation: www.bradycorp.com.
- B. Champion America, Inc: www.Champion-America.com.
- C. Seton Identification Products: www.seton.com/aec.
- D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 NAMEPLATES

- A. Manufacturers:
 - 1. Advanced Graphic Engraving, LLC: www.advancedgraphicengraving.com.
 - 2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 3. Seton Identification Products, a Tricor Direct Company: www.seton.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/4 inch.
 - 3. Background Color: Black.
 - 4. Plastic: Comply with ASTM D709.

2.03 TAGS

- A. Manufacturers:
 - 1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
 - 2. Brady Corporation: www.bradycorp.com.
 - 3. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 4. Seton Identification Products, a Tricor Company: www.seton.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.04 ADHESIVE-BACKED DUCT MARKERS

- A. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch; printed with UV and chemical resistant inks.
- B. Style: Individual Label.

SECTION 23 0553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

2.05 STENCILS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradycorp.com.
 - 2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 3. Seton Identification Products, a Tricor Company: www.seton.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Stencils: With clean cut symbols and letters of following size:
 - 1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
 - 2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
 - 3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.

2.06 PIPE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradycorp.com.
 - 2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
 - 3. Seton Identification Products, a Tricor Company: www.seton.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Color: Comply with ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 9123 for stencil painting.

3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Apply stencil painting in accordance with Section 09 9123.
- D. Install plastic pipe markers in accordance with manufacturer's instructions.
- E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- F. Use tags on piping 3/4 inch diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.
 - 3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- G. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- H. Identify control panels and major control components outside panels with plastic nameplates.
- I. Identify thermostats relating to terminal boxes or valves with adhesive label in discreet location.
- J. Identify valves in main and branch piping with tags.
- K. Identify air terminal units and radiator valves with numbered tags.
- L. Tag automatic controls, instruments, and relays. Key to control schematic.

SECTION 23 0553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

- M. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- N. Install ductwork with adhesive-backed duct markers. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

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PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of refrigerating systems.
- C. Measurement of final operating condition of HVAC 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; 2024, with Errata (2025).
- C. NEBB (TAB) - Procedural Standard for Testing Adjusting and Balancing of Environmental Systems; 2019.
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2023.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- 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 I-P (inch-pound) units only.

1.04 QUALITY ASSURANCE

- A. To avoid conflicts, the Testing and Balancing subcontractor is not to be the controls subcontractor engaged in this project.

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. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - 3. 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. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
 - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: 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.
 - 12. Proper strainer baskets are clean and in place.
 - 13. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Promptly report abnormal conditions in mechanical systems or conditions that prevent system balance.
- D. If, for design reasons, system cannot be properly balanced, report as soon as observed.
- E. Beginning of work means acceptance of existing conditions.

3.03 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 5 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 5 percent of design.

3.04 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.

3.05 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

SECTION 23 0593 TESTING, ADJUSTING, AND BALANCING FOR HVAC

- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.
- M. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.
- N. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

END OF SECTION

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SECTION 23 0713 DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Flexible removable and reusable blanket insulation.
- C. Duct liner.
- D. Weather barrier coatings.
- E. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 23 0553 - Identification for HVAC Piping and Equipment.
- B. Section 23 3100 - 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; 2025.
- D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2024.
- E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- F. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2025.
- G. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2025.
- H. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers; 2015 (Reapproved 2022).
- I. ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation; 2021.
- J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- K. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- L. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- M. SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth; 2016b.
- N. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- O. UL 181A - Closure Systems for Use with Rigid Air Ducts; Current Edition, Including All Revisions.
- P. UL 181B - Closure Systems for Use with Flexible Air Ducts and Air Connectors; Current Edition, Including All Revisions.
- 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 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

SECTION 23 0713 DUCT INSULATION

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section and approved by manufacturer.

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, UL 723, ASTM E84, or UL 723.

2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
 - 1. CertainTeed Corporation: www.certainteed.com.
 - 2. Johns Manville: www.jm.com.
 - 3. Knauf Insulation: www.knaufinsulation.com.
 - 4. Owens Corning Corporation: www.ocbuildingspec.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. K value: 0.25 at 75 degrees F, when tested in accordance with ASTM C518.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM 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.

2.03 GLASS FIBER, RIGID

- A. Manufacturer:
 - 1. CertainTeed Corporation: www.certainteed.com.
 - 2. Johns Manville: www.jm.com.
 - 3. Knauf Insulation: www.knaufinsulation.com.
 - 4. Owens Corning Corporation: www.ocbuildingspec.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation: ASTM C612; rigid, noncombustible.
 - 1. Interior Duct: K Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
 - 2. Exterior Duct: K Value: 0.16 at 75 degrees F, when tested in accordance with ASTM C518.
 - 3. Minimum Density: 3.0 lb/cu ft.

SECTION 23 0713 DUCT INSULATION

- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM 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.

2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturers:
 - 1. Armacell LLC: www.armacell.us.
 - 2. Substitutions: See Section 01 6000 - Product Requirements
- 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.
 - 2. Maximum Service Temperature: 180 degrees F.
 - 3. Connection: Waterproof vapor barrier adhesive.
 - 4. 'K' Value: 0.16 at 75 degrees F, when tested in accordance with ASTM C518.
- C. Vapor Barrier Jacket:
 - 1. 17.5 mils laminated covering.
 - 2. Moisture Vapor Permeability: 0.00 perm inch, when tested in accordance with ASTM E96/E96M.
- D. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.05 FLEXIBLE REMOVABLE AND REUSABLE BLANKET INSULATION

- A. Description: Custom cut and fabricated, removable and reusable blanket insulation system, consisting of inner liner, insulation layer, outer protective jacket, and fastening system.
- B. Provide insulation system based on surface temperature of piping, installed location of piping, and maximum safe-to-touch temperature of jacketing.
- C. Performance Criteria:
 - 1. Safe-to-Touch Temperature of Jacketing: 140 degrees F.

2.06 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. 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.
 - 2. Water Vapor Permeance: Greater than 1.0 perm in accordance with ASTM E96/E96M.

2.07 JACKETING AND ACCESSORIES

- A. Aluminum Jacket:
 - 1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
 - 2. Joining: Longitudinal slip joints and 2 inch laps.
 - 3. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
- B. 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.
 - 3. Water Vapor Transmission: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
 - 4. Mold Resistance: Pass when tested in accordance with ASTM C1338.
 - 5. Emissivity: 0.30 when tested in accordance with ASTM C1371.
 - 6. Manufacturers:
 - a. Polyguard Products; Alumaguard: www.polyguardproducts.com.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements

SECTION 23 0713 DUCT INSULATION

- C. Reinforced Tape:
 - 1. FSK tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.
 - 2. Comply with UL 723 or ASTM E84.
 - 3. Moisture Vapor Permeability: 0.00 perm inch, when tested in accordance with ASTM E96/E96M.
- D. UL181 Tape for Rigid and Flexible Ductwork:
 - 1. Comply with UL 181A for rigid ductwork.
 - 2. Comply with UL 181B for flexible ductwork.
 - 3. Aluminum foil coated with pressure-sensitive adhesive on paper release liner.
 - 4. Foil tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.

2.08 DUCT LINER

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Ductmate Industries, Inc, a DMI Company: www.ductmate.com.
 - 3. Johns Manville: www.jm.com.
 - 4. Knauf Insulation: www.knaufinsulation.com/#sle.
 - 5. Owens Corning Corporation: www.ocbuildingspec.com.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket and rigid board; impregnated surface and edges coated with black composite.
 - 1. Fungal Resistance: No growth when tested according to ASTM G21.
 - 2. Apparent Thermal Conductivity: Maximum of .23 at 75 degrees F.
 - 3. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
 - 4. Minimum Noise Reduction Coefficients:
 - a. 1/2 inch Thickness: 0.30.
 - b. 1 inch Thickness: 0.45.
 - c. 1-1/2 inches Thickness: 0.60.
 - d. 2 inch Thickness: 0.70.
- C. Liner Fasteners: Galvanized steel, impact applied or welded with integral head.

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. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated Ducts Conveying Air Below Ambient Temperature:
 - 1. Provide insulation with vapor barrier jackets.
 - 2. Finish with tape and vapor barrier jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- D. 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.
 - 3. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with aluminum jacket.
 - 4. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with with calked aluminum jacket with seams located on bottom side of horizontal duct section.
 - 5. External Duct Insulation Application:

SECTION 23 0713 DUCT INSULATION

- a. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 - b. Secure insulation without vapor barrier with staples, tape, or wires.
 - c. 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.
 - d. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 - e. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
6. Duct and Plenum Liner Application:
- a. Adhere insulation with adhesive for 100 percent coverage.
 - b. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
 - c. Seal and smooth joints. Seal and coat transverse joints.
 - d. Seal liner surface penetrations with adhesive.
 - e. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.
 - f. Ductwork with liner not to be insulated unless indicated otherwise.

3.03 SCHEDULES

- A. Ductwork not insulated:
 1. Internally insulated ductwork
 2. Relief air ducts (unless noted below)
 3. Exhaust air ducts and plenums (unless noted below)
- B. Ductwork exposed in mechanical and electrical equipment rooms, unfinished spaces:
 1. Supply: Rigid Glass Fiber, 1 1/2 inch thick, faced with ASJ
 2. Return, Mixed air plenums: Rigid Glass Fiber, 1 1/2 inch thick, faced with ASJ
 3. Outside air intake ducts and plenums: Rigid Glass Fiber, 1 inch thick, faced with ASJ
- C. Ductwork exposed to outdoor weather:
 1. Supply and return: Rigid Glass Fiber, 2 inch thick, R Value 12, faced with reinforcing membrane and two coats of vapor barrier mastic or multi-layer vapor barrier. Provide metal jacket.
- D. Ductwork exposed in conditioned spaces:
 1. Supply and return: Not insulated
- E. Concealed Ductwork:
 1. Supply: Flexible Glass Fiber, 1 1/2 inch thick, faced with FSK.
 2. Return above ceilings at a roof level, unconditioned areas and in chases with external wall: Flexible Glass Fiber, 1 1/2 inch thick, faced with FSK.
 3. Return in other locations: not insulated
 4. Exhaust or Relief ducts from exterior penetration to isolation damper: Flexible Glass Fiber, 1 1/2 inch thick, faced with FSK.
- F. Ductwork to be internally lined:
 1. Ductwork downstream of terminal units: Glass Fiber, 1" thick, 10 feet minimum
 2. Transfer ducts and boots: Glass Fiber, 1" thick

END OF SECTION

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SECTION 23 0719 HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Flexible removable and reusable blanket insulation.
- C. Jacketing and accessories.

1.02 REFERENCE STANDARDS

- A. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2026.
- B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- D. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2024).
- E. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2024).
- F. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2025.
- G. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2025.
- H. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- I. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation; 2023.
- J. ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation; 2021.
- K. ASTM C1775 - Standard Specification for Laminate Protective Jacket and Tape for Use Over Thermal Insulation for Outdoor Applications; 2022.
- L. ASTM D610 - Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces; 2025.
- M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- N. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- O. SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth; 2016b.
- P. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 5 years of experience.

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.

SECTION 23 0719 HVAC PIPING INSULATION

- 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, UL 723, ASTM E84, or UL 723.

2.02 GLASS FIBER, RIGID

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com.
 - 2. Johns Manville Corporation: www.jm.com.
 - 3. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: www.knaufinsulation.com.
 - 4. Owens Corning Corporation: www.ocbuildingspec.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
 - 1. K Value: ASTM C177, 0.23 at 75 degrees F.
 - 2. Maximum Service Temperature: 650 degrees F.
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
- D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- E. Vapor Barrier Lap Adhesive: Compatible with insulation.
- F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
- G. Fibrous Glass Fabric:
 - 1. Cloth: Untreated; 9 oz/sq yd weight.
 - 2. Blanket: 1.0 pcf density.
 - 3. Weave: 5 by 5.
- H. Indoor Vapor Barrier Finish:
 - 1. Cloth: Untreated; 9 oz/sq yd weight.
 - 2. Vinyl emulsion type acrylic, compatible with insulation, black color.
- I. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- J. Insulating Cement: ASTM C449.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturers:
 - 1. Aeroflex USA, Inc: www.aeroflexusa.com.
 - 2. Armacell LLC; AP Armaflex: www.armacell.us.
 - 3. K-Flex USA LLC: www.kflexusa.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
 - 1. K Value: 0.25 at 75 degrees F.
 - 2. 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. Must protect against solar radiation.

2.04 JACKETING AND ACCESSORIES

- A. PVC Plastic.
 - 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F.
 - b. Maximum Service Temperature: 150 degrees F.

SECTION 23 0719 HVAC PIPING INSULATION

- c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
- d. Thickness: 10 mil, 0.010 inch.
- e. Connections: Brush on welding adhesive.
- 2. Covering Adhesive Mastic: Compatible with insulation.
- B. Protective Covering for Interior and Exterior Jackets and Fittings: Zeston Series 2000 PVC, 15 mil thickness, ASTM 1784.
- C. Interior Applications: Vapor barrier jackets, kraft reinforced foil vapor barrier with self sealing adhesive joints.
- D. Aluminum Jacket:
 - 1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
 - 2. Thickness: 0.016 inch sheet.
 - 3. Type: Factory-applied, self-adhesive jacketing.
 - 4. Finish: Smooth.
 - 5. Joining: Longitudinal slip joints and 2 inch laps.
 - 6. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
 - 7. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
- E. Aluminum-Foil Laminate Jacket:
 - 1. Factory-applied, pressure sensitive adhesive jacketing to comply with ASTM C1775.
- F. Reinforced Tape:
 - 1. FSK tape suitable for sealing seams between insulation, insulated pipe bends, and fittings resulting in a tight, smooth surface without wrinkles.
 - 2. Comply with UL 723, ASTM E84.
 - 3. Moisture Vapor Permeability: 0.00 perm inch, when tested in accordance with ASTM E96/E96M.
 - 4. Finish: Match insulation.
- G. Vapor Barrier Membranes: ASTM C1136, Type IX.
 - 1. Multilayer Laminate Vapor Barrier:
 - a. Provide multilayer laminate with 1.0 mil, 0.001 inch foil, reversible.
 - b. Thickness: 2.4 mil, 0.002 inch.
 - c. Moisture Vapor Permeability: 0.00 perm inch, when tested in accordance with ASTM E96/E96M.

2.05 ACCESSORIES

- A. General Requirements:
 - 1. Provide required accessories in accordance with and subject to the recommendations of the insulation manufacturer.
 - 2. Furnish compatible materials which do not contribute to corrosion, soften, or otherwise attack surfaces to which applied, in either the wet or dry state.
 - 3. Comply with ASTM C795 requirements for materials to be used on stainless steel surfaces.
 - 4. Supply materials that are asbestos free.
- B. Corrosion Inhibitors:
 - 1. Corrosion Control Gel:
 - a. Corrosion Protection: Comply with ASTM B117 and ASTM D610.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.

SECTION 23 0719 HVAC PIPING INSULATION

- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated Pipes Conveying Fluids Below Ambient Temperature:
 - 1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- E. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- H. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- I. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under the finish jacket.
 - 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 8400.
- K. Extend Vapor barrier jacket and insulation through hangers, wall sleeves and floor sleeves to maintain vapor barrier. Pipe clamp supports are also required to have continuous vapor barrier and insulation.
- L. Insulated piping with vapor barrier: Insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- M. Provide an insert, not less than 6 inches long, of the same thickness as adjoining insulation between support saddle and piping under the finish vapor barrier jacket to prevent insulation from crushing at support points. Inserts to be treated wood blocks or other heavy density insulating material. Factory fabricated inserts may be used.
- N. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.
- O. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV-resistant finish for flexible elastomeric cellular insulation without jacketing.

3.03 SCHEDULE

- A. Cooling Systems:
 - 1. Condensate Drains from Cooling Coils:
 - a. Flexible Elastomeric Cellular Insulation:
 - 1) Pipe Size Range: 1/2-6 inch.
 - 2) Thickness: 1 inch.
 - 2. Refrigerant Suction:
 - a. Flexible Elastomeric Cellular Insulation:
 - 1) Pipe Size Range: [1/2-3] inch.

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- 2) Thickness: [1] inch.
3. Refrigerant Discharge:
 - a. Not insulated.
4. Refrigerant Hot Gas (Bypass and/or Reheat):
 - a. Flexible Elastomeric Cellular Insulation:
 - 1) Pipe Size Range: [1/2-3] inch.
 - 2) Thickness: [1] inch.
5. Refrigerant Liquid Line:
 - a. Not insulated.

END OF SECTION

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PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Damper Operators:
 - 1. Electric operators.
- B. Humidistats:
 - 1. Room humidistats.
 - 2. Limit duct humidistats.
- C. Wall-, Surface-, and Duct-Mounted Sensors:
 - 1. Temperature sensors.
 - 2. Building static pressure transmitters.
 - 3. Room pressure monitors.
 - 4. Static air pressure sensors.
 - 5. Carbon dioxide sensors.
- D. Thermostats:
 - 1. Electric thermostats.
 - 2. Freezestats.
 - 3. Room-mount thermostat accessories.
 - 4. Airstream thermostats.

1.02 RELATED REQUIREMENTS

- A. Section 23 3300 - Air Duct Accessories.
- B. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.
- C. Section 26 2726 - Wiring Devices: Elevation of exposed components.

1.03 REFERENCE STANDARDS

- A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.
- B. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).
- C. ASTM B32 - Standard Specification for Solder Metal; 2020.
- D. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- E. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- F. ASTM B819 - Standard Specification for Seamless Copper Tube for Medical Gas Systems; 2019.
- G. NEMA BS 31032 - Residential Controls—Electrical Wall-Mounted Room Thermostats; 2025.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- J. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2018d, with Addenda (2020).
- K. UL 444 - Communications Cables; Current Edition, Including All Revisions.
- L. ANSI/AMCA 500-D- Laboratory methods of testing dampers for rating.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

SECTION 23 0913 INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

- C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.
- D. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
 - 1. Revise shop drawings to reflect actual installation and operating sequences.
- E. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
- F. Project Record Documents: Record actual location of control components, including panels, thermostats, and sensors.
 - 1. Revise shop drawings to reflect actual installation and operating sequences.
- G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements for additional provisions.
 - 2. Extra Thermostats and Other Exposed Sensors: One of each type.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience approved by manufacturer.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a two year period after Substantial Completion.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 CABLE

- A. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
- B. Cable Type - Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
- C. Cable Applications:
 - 1. All Control System Applications: Use listed NFPA 70 Type CMP plenum cable.
- D. Aluminum conductors shall not be used under any circumstances.

2.03 DAMPER OPERATORS

- A. General:
 - 1. Provide actuators with torque capacity sized for minimum of 20 percent greater than maximum design stream velocity and hold tight seal against maximum system pressures.
 - 2. Provide spring return for two position control and for fail safe operation.
 - 3. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
 - 4. Provide one operator for maximum 36 sq ft damper section.
 - 5. See Section 25 3513 for field-mount damper actuators and operators.
- B. Electric Operators:
 - 1. Manufacturers:
 - a. Honeywell International, Inc; _____: buildingcontrols.honeywell.com/#sle.
 - b. Johnson Controls International, PLC; _____: www.johnsoncontrols.com/#sle.
 - c. Schneider Electric; _____: www.schneider-electric.us/#sle.
 - d. Belimo Aircontrols (USA), Inc[<>]: www.belimo.com/#sle.
 - e. Substitutions: See Section 01 6000 - Product Requirements.

SECTION 23 0913 INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

2. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

C. Inlet Vane Operators:

2.04 WALL-, SURFACE-, AND DUCT-MOUNT SENSORS

A. Temperature Sensors:

1. Manufacturers:
 - a. Dwyer Instruments Inc; _____: www.dwyer-inst.com/#sle.
 - b. Johnson Controls International, PLC; _____: www.johnsoncontrols.com/#sle.
 - c. Veris Industries; _____: www.veris.com/#sle.
2. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
3. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F.
4. 100 ohm platinum RTD is acceptable if used with project DDC controllers.
5. Temperature Sensing Device: Compatible with project DDC controllers.
6. Performance Characteristics:
 - a. RTD:
 - 1) Room Sensor Accuracy: Plus/minus 0.50 degrees F minimum.
 - 2) Duct Averaging Accuracy: Plus/minus 0.50 degrees F minimum.
 - 3) Chilled Water Accuracy: Plus/minus 0.50 degrees F minimum.
 - 4) All Other Accuracy: Plus/minus 0.75 degrees F minimum.
 - 5) Range: Minus 40 degrees F through 220 degrees F minimum.
 - b. Temperature Transmitter:
 - 1) Accuracy: 0.10 degree F minimum or plus/minus 0.20 percent of span.
 - 2) Output: 4 to 20 mA.
 - c. Sensing Range:
 - 1) Provide limited range sensors if required to sense the range expected for a respective point.
 - 2) Use RTD type sensors for extended ranges beyond minus 30 to 230 degrees F.
 - 3) Use temperature transmitters in conjunction with RTDs when RTDs are incompatible with DDC controller direct temperature input.
 - d. Room Temperature Sensors with Integral Digital Display:
 - 1) Construct for surface.
 - 2) Provide a four button keypad with the following capabilities:
 - (a) Indication of space and outdoor temperatures.
 - (b) Display and control fan operation status.
 - (c) Manual occupancy override and indication of occupancy status.
 - (d) Controller mode status.
 - (e) Password enabled setpoint and override modes.

B. Building Static Pressure Transmitters:

1. Single port for direct or tubing connection into wall or ceiling static pressure tip, direct acting, double bell, scale range 0.01 to 6.0 in-wc positive or negative, and sensitivity of 0.0005 in-wc. Transmit electronic signal to receiver with matching scale range.

C. Room Pressure Monitors:

1. Transmitter: Five percent accuracy, adjustable zero and span, 100 to 1 turndown, 0.1 percent of calibrated span linearity, 30 to 50 millisecond response time, minimum overpressure of 150 percent over highest range value, alphanumeric indicating display, wired or wireless connectivity for configuration, and terminal strip within enclosed electronic components.

D. Static-Air Pressure Sensors:

1. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
2. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F.
3. Accuracy: One percent of full scale with repeatability 0.3 percent.
4. Output: 0 to 5 vdc with power at 12 to 28 vdc.

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- E. Carbon Dioxide Sensors, Duct and Wall:
 - 1. General: Provide nondispersive infrared (NDIR), diffusion sampling CO₂ sensors with integral transducers and linear output.
 - 2. Air Temperature: Range of 32 to 122 degrees F.
 - 3. Relative Humidity: Range of 0 to 95 percent (noncondensing).
 - 4. Power Input: Class 2; 12 to 30VDC or 24VAC 50/60 Hz; 100mA max.
 - 5. Calibration Characteristics:
 - a. Automatically compensating algorithm for sensor drift due to sensor degradation.
 - b. Maximum Drift: 2 percent.
 - c. User calibratable with a minimum calibration interval of 5 years.
 - 6. Construction:
 - a. Sensor Chamber: Noncorrosive material for neutral effect on carbon dioxide sample.
 - b. Provide duct mounted sensors with duct probe designed to protect sensing element from dust accumulation and mechanical damage.
 - c. Housing: High impact plastic.

2.05 THERMOSTATS

- A. Electric Thermostats:
 - 1. Type: NEMA BS 31032, 24 volts, with setback/setup temperature control.
 - 2. Service: Cooling only.
 - 3. Covers: Locking with set point adjustment and setpoint indication, with thermometer.
- B. Freezestats:
 - 1. Manufacturers:
 - a. Honeywell International, Inc: buildingcontrols.honeywell.com/#sle.
 - b. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.
 - c. Siemens Industry, Inc: www.siemens.com/#sle.
 - d. Veris Industries: www.veris.com/#sle.
 - e. Automation Components, Inc.: www.workaci.com.
 - f. Substitutions: See Section 01 6000 - Product Requirements.
 - 2. Configuration: Vapor-filled capillary Vapor-filled capillary.
 - 3. Probe Sensing Length: 20 feet.
 - 4. Setpoint Adjust Control: Screw with manual reset switch.
 - 5. Switch Type: DPDT, snap-action, form C in dust-protected enclosure.
 - 6. Sensing Range: 10 to 54 deg F.
 - 7. Mounting: Locate on as indicated on drawings or cooling coil intake side.
 - 8. Field Interface: Connect load line-voltage to fan VFD or starter and connect auxiliary circuit to BMS alarm.
 - 9. Electrical Rating: Pilot duty, 125 VA at 125 to 600 VAC.
- C. Room-Mounted Thermostat Accessories:
 - 1. Thermostat Covers: Brushed aluminum.
 - 2. Insulating Bases: For thermostats located on exterior walls.
 - 3. Thermostat Guards: Metal mounted on separate base.
 - 4. Adjusting Key: As required for device.
 - 5. Aspirating Boxes: Where indicated for thermostats requiring flush installation.
- D. Airstream Thermostats:
 - 1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.
 - 2. Averaging service remote bulb element: 7.5 feet.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that systems are ready to receive work.
- C. Beginning of installation means installer accepts existing conditions.
- D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

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- E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.
- F. Ensure installation of components is complementary to installation of similar components.
- G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check and verify location of thermostats with plans and room details before installation. Locate 60 inches above floor. Align with lighting switches and humidistats; see Section 26 2726.
- C. Mount freeze protection thermostats using flanges and element holders.
- D. Provide separable sockets for liquids and flanges for air bulb elements.
- E. Provide guards on thermostats in entrances.
- F. Provide mixing dampers of opposed blade construction arranged to mix streams. Provide pilot positioners on mixed air damper motors.
- G. Provide isolation (two-position) dampers of parallel blade construction.
- H. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.
- I. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.
- J. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of NFPA 70.
 - 1. Cable and wiring installed in return air plenums shall be plenum rated.

3.03 MAINTENANCE

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements relating to maintenance service.
- B. Provide a separate maintenance contract for specified maintenance service.
- C. Provide service and maintenance of control system for one year from Date of Substantial Completion.
- D. Provide complete service of controls systems, including call backs, and submit written report of each service call.

END OF SECTION

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PART 1 GENERAL

1.01 SECTION INCLUDES

- A. System description.
- B. Operator interface.
- C. Controllers.
- D. Power supplies and line filtering.
- E. System software.
- F. Controller software.
- G. HVAC control programs.

1.02 RELATED REQUIREMENTS

- A. Section 23 0913 - Instrumentation and Control Devices for HVAC.
- B. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2020, with Errata and Amendments (2022).
- B. MIL-STD-810 - Environmental Engineering Considerations and Laboratory Tests; 2019h, with Editorial Revision (2022).
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- B. Submit with bid cost to train Owner's personnel in basic operation of system, basic and advanced programming of system, and a detailed outline of training, including time frame.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for each system component and software module.
- C. Shop Drawings:
 - 1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
 - 2. List connected data points, including connected control unit and input device.
 - 3. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration digital media containing graphics.
 - 4. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
 - 5. Indicate description and sequence of operation of operating, user, and application software.
- D. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.
- E. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
 - 1. Revise shop drawings to reflect actual installation and operating sequences.
 - 2. Include submittals data in final "Record Documents" form.
- F. Operation and Maintenance Data:
 - 1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
 - 2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.

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3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

- G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.
- D. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for purpose specified and indicated.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a one year period after Substantial Completion.
- C. Provide five year manufacturer's warranty for field programmable micro-processor based units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Johnson Controls, Inc: www.johnsoncontrols.com.
- B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SYSTEM DESCRIPTION

- A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units.
- B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.
- C. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.
- D. Controls for variable air volume terminals, radiation, reheat coils, unit heaters, fan coils, and the like when directly connected to the control units. Individual terminal unit control is specified in Section 23 0913.
- E. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.
- F. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

2.03 OPERATOR INTERFACE

- A. PC Based Work Station:
- B. Workstation, controllers, and control backbone to communicate using BACnet protocol and addressing.
- C. BACnet protocol to comply with ASHRAE Std 135.
- D. Hardware:

2.04 CONTROLLERS

- A. Building Controllers:
 1. General:
 - a. Manage global strategies by one or more, independent, standalone, microprocessor based controllers.
 - b. Provide sufficient memory to support controller's operating system, database, and programming requirements.
 - c. Share data between networked controllers.

SECTION 23 0923 DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

- d. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
- e. Utilize real-time clock for scheduling.
- f. Continuously check processor status and memory circuits for abnormal operation.
- g. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
- h. Communication with other network devices to be based on assigned protocol.
2. Communication:
 - a. Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.
 - b. Perform routing when connected to a network of custom application and application specific controllers.
 - c. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
3. Anticipated Environmental Ambient Conditions:
 - a. Outdoors and/or in Wet Ambient Conditions:
 - 1) Mount within waterproof enclosures.
 - 2) Rated for operation at 40 to 150 degrees F.
 - b. Conditioned Space:
 - 1) Mount within dustproof enclosures.
 - 2) Rated for operation at 32 to 120 degrees F.
4. Local Keypad and Display for each Controller:
 - a. Use for interrogating and editing data.
 - b. System security password prevents unauthorized use.
5. Provisions for Serviceability:
 - a. Diagnostic LEDs for power, communication, and processor.
 - b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
6. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
7. Power and Noise Immunity:
 - a. Maintain operation at 90 to 110 percent of nominal voltage rating.
 - b. Perform orderly shutdown below 80 percent of nominal voltage.
 - c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.
- B. Custom Application Controller:
 1. General:
 - a. Provide sufficient memory to support controller's operating system, database, and programming requirements.
 - b. Share data between networked, microprocessor based controllers.
 - c. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
 - d. Utilize real-time clock for scheduling.
 - e. Continuously check processor status and memory circuits for abnormal operation.
 - f. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
 - g. Communication with other network devices to be based on assigned protocol.
 2. Communication:
 - a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
 - b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
 3. Anticipated Environmental Ambient Conditions:
 - a. Outdoors and/or in Wet Ambient Conditions:
 - 1) Mount within waterproof enclosures.

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- 2) Rated for operation at 40 to 150 degrees F.
 - b. Conditioned Space:
 - 1) Mount within dustproof enclosures.
 - 2) Rated for operation at 32 to 120 degrees F.
 4. Local Keypad and Display for each Controller:
 - a. Use for interrogating and editing data.
 - b. System security password prevents unauthorized use.
 5. Provisions for Serviceability:
 - a. Diagnostic LED's for power, communication, and processor.
 - b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
 6. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
 7. Power and Noise Immunity:
 - a. Maintain operation at 90 to 110 percent of nominal voltage rating.
 - b. Perform orderly shutdown below 80 percent of nominal voltage.
 - c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.
- C. Application Specific Controllers:
1. General:
 - a. Not fully user programmable, microprocessor based controllers dedicated to control specific equipment.
 - b. Customized for operation within the confines of equipment served.
 - c. Communication with other network devices to be based on assigned protocol.
 2. Communication:
 - a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
 - b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
 3. Anticipated Environmental Ambient Conditions:
 - a. Outdoors and/or in Wet Ambient Conditions:
 - 1) Mount within waterproof enclosures.
 - 2) Rated for operation at 40 to 150 degrees F.
 - b. Conditioned Space:
 - 1) Mount within dustproof enclosures.
 - 2) Rated for operation at 32 to 120 degrees F.
 4. Local Keypad and Display for each Controller:
 - a. Use for interrogating and editing data.
 - b. System security password prevents unauthorized use.
 5. Provisions for Serviceability:
 - a. Diagnostic LEDs for power, communication, and processor.
 - b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
 6. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
 7. Power and Noise Immunity:
 - a. Maintain operation at 90 to 110 percent of nominal voltage rating.
 - b. Perform orderly shutdown below 80 percent of nominal voltage.
 - c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3 feet.
- D. Input/Output Interface:
1. Hardwired inputs and outputs tie into the DDC system through building, custom application, or application specific controllers.
 2. All Input/Output Points:
 - a. Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration.

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- b. Provide universal type for building and custom application controllers where input or output is software designated as either binary or analog type with appropriate properties.
3. Binary Inputs:
 - a. Allow monitoring of On/Off signals from remote devices.
 - b. Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise.
 - c. Sense dry contact closure with power provided only by the controller.
4. Pulse Accumulation Input Objects: Comply with all requirements of binary input objects and accept up to 10 pulses per second.
5. Analog Inputs:
 - a. Allow for monitoring of low voltage 0 to 10 VDC, 4 to 20 mA current, or resistance signals (thermistor, RTD).
 - b. Compatible with and field configurable to commonly available sensing devices.
6. Binary Outputs:
 - a. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
 - b. Outputs provided with three position (On/Off/Auto) override switches.
 - c. Status lights for building and custom application controllers to be selectable for normally open or normally closed operation.
7. Analog Outputs:
 - a. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.
 - b. Provide status lights and two position (AUTO/MANUAL) switch for building and custom application controllers with manually adjustable potentiometer for manual override on building and custom application controllers.
 - c. Drift to not exceed 0.4 percent of range per year.
8. Tri State Outputs:
 - a. Coordinate two binary outputs to control three point, floating type, electronic actuators without feedback.
 - b. Limit the use of three point, floating devices to the following zone and terminal unit control applications:
 - 1) VAV terminal units.
 - 2) Duct mounted heating coils.
 - 3) Zone dampers.
 - 4) Radiation.
 - c. Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.
9. System Object Capacity:
 - a. System size to be expandable to twice the number of input output objects required by providing additional controllers, including associated devices and wiring.
 - b. Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions.

2.05 POWER SUPPLIES AND LINE FILTERING

- A. Power Supplies:
 1. Provide UL listed control transformers with Class 2 current limiting type or over-current protection in both primary and secondary circuits for Class 2 service as required by the NEC.
 2. Limit connected loads to 80 percent of rated capacity.
 3. Match DC power supply to current output and voltage requirements.
 4. Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.
 5. Regulation to be 1 percent combined line and load with 100 microsecond response time for 50 percent load changes.
 6. Provide over-voltage and over-current protection to withstand a 150 percent current overload for 3 seconds minimum without trip-out or failure.
 7. Operational Ambient Conditions: 32 to 120 degrees F.

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8. EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD-810 for shock and vibration.
 9. Line voltage units UL recognized and CSA approved.
- B. Power Line Filtering:
1. Provide external or internal transient voltage and surge suppression component for all workstations and controllers.
 2. Minimum surge protection attributes:
 - a. Dielectric strength of 1000 volts minimum.
 - b. Response time of 10 nanoseconds or less.
 - c. Transverse mode noise attenuation of 65 dB or greater.
 - d. Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.

2.06 LOCAL AREA NETWORK (LAN)

- A. Provide communication between control units over local area network (LAN).
- B. LAN Capacity: Not less than 60 stations or nodes.
- C. Break in Communication Path: Alarm and automatically initiate LAN reconfiguration.
- D. LAN Data Speed: Minimum 19.2 Kb.
- E. Communication Techniques: Allow interface into network by multiple operation stations and by auto-answer/auto-dial modems. Support communication over telephone lines utilizing modems.
- F. Transmission Median: Fiber optic or single pair of solid 24 gauge twisted, shielded copper cable.
- G. Network Support: Time for global point to be received by any station, shall be less than 3 seconds. Provide automatic reconfiguration if any station is added or lost. If transmission cable is cut, reconfigure two sections with no disruption to system's operation, without operator intervention.

2.07 SYSTEM SOFTWARE

- A. Operating System:
 1. Concurrent, multi-tasking capability.
 - a. Common Software Applications Supported: Microsoft Excel.
 2. System Graphics:
 - a. Allow up to 10 graphic screens, simultaneously displayed for comparison and monitoring of system status.
 - b. Animation displayed by shifting image files based on object status.
 - c. Provide method for operator with password to perform the following:
 - 1) Move between, change size, and change location of graphic displays.
 - 2) Modify on-line.
 - 3) Add, delete, or change dynamic objects consisting of:
 - (a) Analog and binary values.
 - (b) Dynamic text.
 - (c) Static text.
 - (d) Animation files.
 3. Custom Graphics Generation Package:
 - a. Create, modify, and save graphic files and visio format graphics in PCX formats.
 - b. HTML graphics to support web browser compatible formats.
 - c. Capture or convert graphics from AutoCAD.
 4. Standard HVAC Graphics Library:
 - a. HVAC Equipment:
 - 1) Air Handlers.
 - 2) Terminal HVAC Units.
 - 3) Fan Coil Units.
 - b. Ancillary Equipment:
 - 1) Dampers.
 - 2) Ductwork.
 - c. File Format Compatible with Graphics Generation Package Program.
- B. Workstation System Applications:

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1. Automatic System Database Save and Restore Functions:
 - a. Current database copy of each Building Controller is automatically stored on hard disk.
 - b. Automatic update occurs upon change in any system panel.
 - c. In the event of database loss in any system panel, the first workstation to detect the loss automatically restores the database for that panel unless disabled by the operator.
2. Manual System Database Save and Restore Functions by Operator with Password Clearance:
 - a. Save database from any system panel.
 - b. Clear a panel database.
 - c. Initiate a download of a specified database to any system panel.
3. Software provided allows system configuration and future changes or additions by operators under proper password protection.
4. On-line Help:
 - a. Context-sensitive system assists operator in operation and editing.
 - b. Available for all applications.
 - c. Relevant screen data provided for particular screen display.
 - d. Additional help available via hypertext.
5. Security:
 - a. Operator log-on requires user name and password to view, edit, add, or delete data.
 - b. System security selectable for each operator.
 - c. System supervisor sets passwords and security levels for all other operators.
 - d. Operator passwords to restrict functions accessible to viewing and/or changing system applications, editor, and object.
 - e. Automatic, operator log-off results from keyboard or mouse inactivity during user-adjustable, time period.
 - f. All system security data stored in encrypted format.
6. System Diagnostics:
 - a. Operations Automatically Monitored:
 - 1) Workstations.
 - 2) Printers.
 - 3) Modems.
 - 4) Network connections.
 - 5) Building management panels.
 - 6) Controllers.
 - b. Device failure is annunciated to the operator.
7. Alarm Processing:
 - a. All system objects are configurable to "alarm in" and "alarm out" of normal state.
 - b. Configurable Objects:
 - 1) Alarm limits.
 - 2) Alarm limit differentials.
 - 3) States.
 - 4) Reactions for each object.
8. Alarm Messages:
 - a. Descriptor: English language.
 - b. Recognizable Features:
 - 1) Source.
 - 2) Location.
 - 3) Nature.
9. Configurable Alarm Reactions by Workstation and Time of Day:
 - a. Logging.
 - b. Printing.
 - c. Starting programs.
 - d. Displaying messages.
 - e. Dialing out to remote locations.
 - f. Paging.

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- g. Providing audible annunciation.
- h. Displaying specific system graphics.
- 10. Custom Trend Logs:
 - a. Definable for any data object in the system including interval, start time, and stop time.
 - b. Trend Data:
 - 1) Sampled and stored on the building controller panel.
 - 2) Archivable on hard disk.
 - 3) Retrievable for use in reports, spreadsheets and standard database programs.
 - 4) Archival on LAN accessible storage media including hard disk, tape, Raid array drive, and virtual cloud environment.
 - 5) Protected and encrypted format to prevent manipulation, or editing of historical data and event logs.
- 11. Alarm and Event Log:
 - a. View all system alarms and change of states from any system location.
 - b. Events listed chronologically.
 - c. Operator with proper security acknowledges and clears alarms.
 - d. Alarms not cleared by operator are archived to the workstation hard disk.
- 12. Object, Property Status and Control:
 - a. Provide a method to view, edit if applicable, the status of any object and property in the system.
 - b. Status Available by the Following Methods:
 - 1) Menu.
 - 2) Graphics.
 - 3) Custom Programs.
- 13. Reports and Logs:
 - a. Reporting Package:
 - 1) Allows operator to select, modify, or create reports.
 - 2) Definable as to data content, format, interval, and date.
 - 3) Archivable to hard disk.
 - b. Real-time logs available by type or status such as alarm, lockout, normal, etc.
 - c. Stored on hard disk and readily accessible by standard software applications, including spreadsheets and word processing.
 - d. Set to be printed on operator command or specific time(s).
- 14. Reports:
 - a. Standard:
 - 1) Objects with current values.
 - 2) Current alarms not locked out.
 - 3) Disabled and overridden objects, points and SNVTs.
 - 4) Objects in manual or automatic alarm lockout.
 - 5) Objects in alarm lockout currently in alarm.
 - 6) Logs:
 - (a) Alarm History.
 - (b) System messages.
 - (c) System events.
 - (d) Trends.
 - b. Custom:
 - 1) Daily.
 - 2) Weekly.
 - 3) Monthly.
 - 4) Annual.
 - 5) Time and date stamped.
 - 6) Title.
 - 7) Facility name.
 - c. Tenant Override:

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- 1) Monthly report showing total, requested, after-hours HVAC and lighting services on a daily basis for each tenant.
- 2) Annual report showing override usage on a monthly basis.
- d. Electrical, Fuel, and Weather:
 - 1) Electrical Meter(s):
 - (a) Monthly showing daily electrical consumption and peak electrical demand with time and date stamp for each meter.
 - (b) Annual summary showing monthly electrical consumption and peak demand with time and date stamp for each meter.
 - 2) Fuel Meter(s):
 - (a) Monthly showing daily natural gas consumption for each meter.
 - (b) Annual summary showing monthly consumption for each meter.
 - 3) Weather:
 - (a) Monthly showing minimum, maximum, average outdoor air temperature and heating/cooling degree-days for the month.
- C. Workstation Applications Editors:
 1. Provide editing software for each system application at PC workstation.
 2. Downloaded application is executed at controller panel.
 3. Full screen editor for each application allows operator to view and change:
 - a. Configuration.
 - b. Name.
 - c. Control parameters.
 - d. Set-points.
 4. Scheduling:
 - a. Monthly calendar indicates schedules, holidays, and exceptions.
 - b. Allows several related objects to be scheduled and copied to other objects or dates.
 - c. Start and stop times adjustable from master schedule.
 5. Custom Application Programming:
 - a. Create, modify, debug, edit, compile, and download custom application programming during operation and without disruption of all other system applications.
 - b. Programming Features:
 - 1) English oriented language, based on BASIC, FORTRAN, C, or PASCAL syntax allowing for free form programming.
 - 2) Alternative language graphically based using appropriate function blocks suitable for all required functions and amenable to customizing or compounding.
 - 3) Insert, add, modify, and delete custom programming code that incorporates word processing features such as cut/paste and find/replace.
 - 4) Allows the development of independently, executing, program modules designed to enable and disable other modules.
 - 5) Debugging/simulation capability that displays intermediate values and/or results including syntax/execution error messages.
 - 6) Support for conditional statements (IF/THEN/ELSE/ELSE-F) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
 - 7) Support for floating-point arithmetic utilizing plus, minus, divide, times, square root operators; including absolute value; minimum/maximum value from a list of values for mathematical functions.
 - 8) Language consisting of resettable, predefined, variables representing time of day, day of the week, month of the year, date; and elapsed time in seconds, minutes, hours, and days where the variable values can be used in IF/THEN comparisons, calculations, programming statement logic, etc.
 - 9) Language having predefined variables representing status and results of the system software enables, disables, and changes the set points of the controller software.

2.08 CONTROLLER SOFTWARE

- A. All applications reside and operate in the system controllers and editing of all applications occurs at the operator workstation.

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- B. System Security:
 - 1. User access secured via user passwords and user names.
 - 2. Passwords restrict user to the objects, applications, and system functions as assigned by the system manager.
 - 3. User Log On/Log Off attempts are recorded.
 - 4. Automatic Log Off occurs following the last keystroke after a user defined delay time.
- C. Object or Object Group Scheduling:
 - 1. Weekly Schedules Based on Separate, Daily Schedules:
 - a. Include start, stop, optimal stop, and night economizer.
 - b. 10 events maximum per schedule.
 - c. Start/stop times adjustable for each group object.
 - 2. Exception Schedules:
 - a. Based on any day of the year.
 - b. Defined up to one year in advance.
 - c. Automatically discarded and replaced with standard schedule for that day of the week upon execution.
 - 3. Holiday or Special Schedules:
 - a. Capability to define up to 99 schedules.
 - b. Repeated annually.
 - c. Length of each period is operator defined.
- D. Provide standard application for equipment coordination and grouping based on function and location to be used for scheduling and other applications.
- E. Alarms:
 - 1. Binary object is set to alarm based on the operator specified state.
 - 2. Analog object to have high/low alarm limits.
 - 3. All alarming is capable of being automatically and manually disabled.
 - 4. Alarm Reporting:
 - a. Operator determines action to be taken for alarm event.
 - b. Alarms to be routed to appropriate workstation.
 - c. Reporting Options:
- F. Demand Limiting:
 - 1. Building power consumption monitored from signals generated by a pulse generator, mounted at the building power meter.
 - 2. Demand limit controlled via load shedding or load restoration in a predetermined and predictive manner.
 - 3. Demand Reduction Methods:
 - 4. Relevant variables that influence demand limiting control are based on the power company methodology for computing demand charges.
 - 5. Operator On-Line Changes Allowed:
 - 6. Information and Reports available Hourly, Daily, and Monthly:
 - a. Total electric consumption.
 - b. Peak demand.
 - c. Date and time of peak demand.
 - d. Daily peak demand.
- G. Maintenance Management: System monitors equipment status and generates maintenance messages based upon user-designated run-time limits.
- H. Sequencing: Application software based upon specified sequences of operation in Section 23 0993.
- I. PID Control Characteristics:
 - 1. Direct or reverse action.
 - 2. Anti-windup.
 - 3. Calculated, time-varying, analog value, positions an output or stages a series of outputs.
 - 4. User selectable controlled variable, set-point, and PED gains.
- J. Staggered Start Application:

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1. Prevents all controlled equipment from simultaneously restarting after power outage.
 2. Order of equipment startup is user selectable.
- K. Energy Calculations:
1. Accumulated instantaneous power or flow rates are converted to energy use data.
 2. Algorithm calculates a rolling average and allows window of time to be user specified in minute intervals.
 3. Algorithm calculates a fixed window average with a digital input signal from a utility meter defining the start of the window period that in turn synchronizes the fixed-window average with that used by the power company.
- L. Anti-Short Cycling:
1. All binary output objects protected from short-cycling.
 2. Allows minimum on-time and off-time to be selected.
- M. On-Off Control with Differential:
1. Algorithm allows binary output to be cycled based on a controlled variable and set-point.
 2. Algorithm to be direct-acting or reverse-acting incorporating an adjustable differential.
- N. Run-Time Totalization:
1. Totalize run-times for all binary input objects.
 2. Provides operator with capability to assign high run-time alarm.

2.09 HVAC CONTROL PROGRAMS

- A. General:
1. Support Inch-pounds and SI (metric) units of measurement.
 2. Identify each HVAC Control system.
- B. Optimal Run Time:
- C. Supply Air Reset:

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

3.02 INSTALLATION

- A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.
- B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 23 0993.
- C. Color Graphic Panels: Provide color graphic-panel displays as depicted in mechanical drawings for each system and floor plan containing associated points identified on point list, sequence of operation and/or control diagrams with controls to allow issuing of setpoint changes and commands.
- D. Provide with 120v AC, 15 amp dedicated emergency power circuit to each programmable control unit.
- E. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of NFPA 70.
1. Cable and wiring installed in return air plenums shall be plenum rated.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.
- B. Provide service engineer to instruct Owner's representative in operation of systems plant and equipment for 3 day period.
- C. Provide basic operator training for two persons on data display, alarm and status descriptors, requesting data, execution of commands and request of logs. Include a minimum of 8 hours dedicated instructor time. Provide training on site.

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3.04 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate complete and operating system to Owner.

3.05 MAINTENANCE

- A. Provide service and maintenance of energy management and control systems for one years from Date of Substantial Completion.
- B. Provide two complete inspections, one in each season, to inspect, calibrate, and adjust controls as required, and submit written reports.
- C. Provide complete service of systems, including call backs. Make minimum of four complete normal inspections of approximately eight hours duration in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.

END OF SECTION

SECTION 23 2300 REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping.
- B. Refrigerant.
- C. Moisture and liquid indicators.
- D. Valves.
- E. Strainers.
- F. Filter-driers.
- G. Flexible connections.

1.02 RELATED REQUIREMENTS

- A. Section 09 9123 - Interior Painting.
- B. Section 23 0719 - HVAC Piping Insulation.

1.03 REFERENCE STANDARDS

- A. AHRI 730 (I-P) - Flow Capacity Rating of Suction Line Filters and Suction Line Filter Driers; 2013 (Reapproved 2014).
- B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2026).
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- D. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.
- E. ASME B31.9 - Building Services Piping; 2025.
- F. 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; 2025, with Errata.
- G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- H. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.
- I. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.
- J. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide general assembly of specialties, including manufacturer's catalogue information. Provide manufacturer's catalog data including load capacity.
- C. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.
- D. Design Data: Submit design data indicating pipe sizing. Indicate load-carrying capacity of trapeze, multiple pipe, and riser support hangers.
- E. Test Reports: Indicate results of leak test, acid test.
- F. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.
- G. Submit welders certification of compliance with ASME BPVC-IX.
- H. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.
- I. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Filter-Dryer Cartridges: One of each type and size.
 - 3. Extra Refrigerant: One container of refrigerant, 30 pounds size.

SECTION 23 2300 REFRIGERANT PIPING

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store piping and specialties in shipping containers with labeling in place.
- B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
- C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure integrity of system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.
- C. Liquid Indicators:
 - 1. Use line size liquid indicators in main liquid line leaving condenser.
 - 2. If receiver is provided, install in liquid line leaving receiver.
 - 3. Use line size on leaving side of liquid solenoid valves.
- D. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.
- E. Pressure Relief Valves: Use on ASME receivers and pipe to outdoors.
- F. Filter-Driers:
 - 1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
 - 2. Use a filter-drier on suction line just ahead of compressor.
- G. Receivers:
 - 1. Use on systems with long piping runs.
- H. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

2.02 REGULATORY REQUIREMENTS

- A. Comply with ASME B31.9 for installation of piping system.

2.03 PIPING

- A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
 - 1. Fittings: ASME B16.22 wrought copper.
 - 2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.
- B. Pipe Supports and Anchors:
 - 1. Provide hangers and supports that comply with MSS SP-58.
 - a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.
 - 3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 - 6. Vertical Support: Steel riser clamp.
 - 7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - 8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
 - 9. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
 - 10. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

SECTION 23 2300 REFRIGERANT PIPING

11. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
 - a. Bases: High density, UV tolerant, polypropylene or reinforced PVC.
 - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
 - d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
 - e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.

2.04 REFRIGERANT

- A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

2.05 MOISTURE AND LIQUID INDICATORS

- A. Manufacturers:
 1. Henry Technologies: www.henrytech.com.
 2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com.
 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Indicators: Double port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.06 VALVES

- A. Manufacturers:
 1. Hansen Technologies Corporation: www.hantech.com.
 2. Henry Technologies: www.henrytech.com.
 3. Flomatic Valves: www.flomatic.com.
 4. Parker Hannifin - Sporlan Division: www.parker.com/#sle.
 5. Alco
 6. Mueller Brass
 7. Superior Valves
 8. Substitutions: See Section 01 6000 - Product Requirements.
- B. Ball Valves:
 1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.

2.07 STRAINERS

- A. Straight Line or Angle Line Type:
 1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

2.08 FLEXIBLE CONNECTORS

- A. Manufacturers:
 1. Circuit Hydraulics, Ltd: www.circuit-hydraulics.co.uk.
 2. Flexicraft Industries: www.flexicraft.com.
 3. Penflex: www.penflex.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure of 500 psi.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain-end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

SECTION 23 2300 REFRIGERANT PIPING

3.02 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.
- D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.5.
 - 2. Support horizontal piping as indicated.
 - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- G. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
- H. Provide clearance for installation of insulation and access to valves and fittings.
- I. Provide access to concealed valves and fittings.
- J. Flood piping system with nitrogen when brazing.
- K. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.
- L. Prepare unfinished pipe, fittings, supports, and accessories for finish painting. See Section 09 9123.
- M. Insulate piping.
- N. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.
- O. Fully charge completed system with refrigerant after testing.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Test refrigeration system in accordance with ASME B31.5.
- C. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using halide torch. Test and repair piping until no leakage.

3.04 SCHEDULES

- A. Hanger Spacing for Copper Tubing.
 - 1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 - 2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 - 3. 1-3/8 inch OD: Maximum span, 7 feet; minimum rod size, 3/8 inch.
 - 4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 - 5. 2-1/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
- B. Hanger Spacing for Steel Piping.
 - 1. 1/2 inch, 3/4 inch, and 1 inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
 - 2. 1-1/4 inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 - 3. 1-1/2 inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 - 4. 2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
 - 5. 2-1/2 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.

END OF SECTION

SECTION 23 3100 HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ducts.
- B. Flexible ducts.

1.02 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- F. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for duct materials.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

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. Fibrous glass duct can be substituted at the Contractor's option.
- C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 23 3319.
- D. Duct Shape and Material in accordance with Allowed Static Pressure Range:
 - 1. Round: Plus or minus 2 in-wc of galvanized steel.
 - 2. Rectangular: Plus or minus 1/2 in-wc of galvanized steel.
- E. 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 pressure class, galvanized steel.
 - b. Outside Air Intake: 1/2 in-wc pressure class, galvanized steel.
 - c. Return and Relief Air: 1/2 in-wc pressure class, galvanized steel.
 - d. General Exhaust Air: 1/2 in-wc pressure class, galvanized steel.
- F. Duct Fabrication Requirements:
 - 1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
 - 2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
 - 3. Construct tees, 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 airfoil 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.

SECTION 23 3100 HVAC DUCTS AND CASINGS

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. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
7. 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.
- B. Rectangular Metal Duct:
 1. Rectangular Single Wall: Rectangular, longitudinal lock seam duct with galvanized steel wall.
- 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 in accordance with 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. 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.
 3. 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.
 4. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.03 FLEXIBLE DUCTS

- A. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form spiral helix.
 1. Insulation: R6 insulation with polyethylene vapor barrier film.
 2. Pressure Rating: 10 in-wc positive and 5 in-wc negative.
 3. Maximum Velocity: 5500 fpm.
 4. Temperature Range: Minus 20 degrees F to 250 degrees F.

END OF SECTION

SECTION 23 3300 AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Backdraft dampers - metal.
- B. Duct test holes.
- C. Flexible duct connectors.
- D. Volume control dampers.

1.02 RELATED REQUIREMENTS

- A. Section 23 3100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- B. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.
- C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- D. ANSI/AMCA 500-D - Laboratory methods of testing dampers for rating.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide for shop-fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. 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. Louvers & Dampers, Inc: www.louvers-dampers.com.
 - 2. Nailor Industries Inc: www.nailor.com.
 - 3. Ruskin Company: www.ruskin.com.
 - 4. Greenheck: www.greenheck.com
- B. Gravity Backdraft Dampers, Size 18 by 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.
- C. Performance: Test in accordance with AMCA 500-D
- D. Approved for Exhaust/Relief air systems only.
- E. Leakage: 20 cfm per square foot at 1 inches wg pressure.

2.02 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.03 FLEXIBLE DUCT CONNECTORS

- A. Manufacturers:
 - 1. Carlisle HVAC Products: www.carlislehvac.com.
 - 2. Ductmate Industries, Inc, a DMI Company: www.ductmate.com.
 - 3. Elgen Manufacturing: www.elgenmfg.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.

SECTION 23 3300 AIR DUCT ACCESSORIES

- 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.
 - a. Net Fabric Width: Approximately 6 inches wide.
- D. Maximum Installed Length: 14 inch.

2.04 VOLUME CONTROL DAMPERS

- A. Manufacturers:
 - 1. Louvers & Dampers, Inc: www.louvers-dampers.com.
 - 2. Nailor Industries Inc: www.nailor.com.
 - 3. Ruskin Company: www.ruskin.com.
 - 4. Greenheck: www.greenheck.com
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Splitter Dampers:
 - 1. Material: Same gauge as duct to 24 inches size in either direction, and two gauges heavier for sizes over 24 inches.
 - 2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
 - 3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.
- D. Single Blade Dampers:
 - 1. Fabricate for duct sizes up to 6 by 30 inch.
 - 2. Blade: 24 gauge, 0.0239 inch, minimum.
- E. Multi-Blade Damper: Fabricate consisting of opposed blades with maximum blade sizes 8 by 72 inches. Assemble center- and edge-crimped blades in prime-coated or galvanized-channel frame with suitable hardware.
 - 1. Blade: 18 gauge, 0.0478 inch, minimum.
- F. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.
 - 1. Manufacturers:
 - a. Carlisle HVAC Products; Dynair End Bearing Leak Resistant Sets: www.carlislehvac.com.
 - b. Elgen Manufacturing Company, Inc; Snap-in Bushing: www.elgenmfg.com.

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 3100 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 size access door for hand and shoulder access, or as indicated on drawings. Provide minimum 4 by 4 inch size access door for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Demonstrate re-setting of fire dampers to authorities having jurisdiction and Owner's representative.
- F. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

SECTION 23 3300 AIR DUCT ACCESSORIES

- G. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- H. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum two duct widths from duct take-off.
- I. Use splitter dampers only where indicated.
- J. 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.
- K. Cut or drill temporary test holes in duct as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist on metal caps.
- L. Permanent test holes shall be factory fabricated, airtight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

END OF SECTION

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SECTION 23 3600 AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single-duct terminal units.
 - 1. Variable-volume units.

1.02 RELATED REQUIREMENTS

- A. Section 23 0548 - Vibration and Seismic Controls for HVAC.
- B. Section 23 3100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

- A. AHRI 880 (I-P) - Performance Rating of Air Terminals; 2017 (Reaffirmed 2023).
- B. ASHRAE Std 130 - Laboratory Methods of Testing Air Terminal Units; 2025.
- C. ASTM A492 - Standard Specification for Stainless Steel Rope Wire; 1995 (Reapproved 2019).
- D. ASTM A603 - Standard Specification for Metallic-Coated Steel Structural Wire Rope; 2019.
- E. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2025.
- F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- G. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- H. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2024.
- I. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate airflow, static pressure, and NC designation. Include electrical characteristics and connection requirements.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for air terminal units.

PART 2 PRODUCTS

2.01 SINGLE-DUCT, VARIABLE-VOLUME UNITS

- A. Manufacturers:
 - 1. Titus-HVAC: www.titus-hvac.com.
 - 2. Price Industries, Inc.: www.priceindustries.com.
 - 3. Trane, a brand of Ingersoll Rand: www.trane.com.
 - 4. Nailor Industries: www.nailor.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. General:
 - 1. Factory-assembled, AHRI 880 (I-P) rated and bearing the AHRI seal, air volume control terminal with damper assembly, flow sensor, externally mounted volume controller, duct collars, and all required features.
 - 2. Control box bearing identification, including but not necessarily limited to nominal cfm, maximum and minimum factory-set airflow limits, coil type and coil (right or left hand) connection, where applicable.
- C. Unit Casing:
 - 1. Minimum 22 gauge, 0.0299 inch galvanized steel.
 - a. Assembled with longitudinal lock seam construction.
 - b. Casing leakage to meet ASHRAE Std 130.

SECTION 23 3600 AIR TERMINAL UNITS

2. Air Inlet Collar: Provide round, suitable for standard flexible duct sizes.
3. Unit Discharge: Rectangular, with slip-and-drive connections.
4. Acceptable Liners:
 - a. 1/2 inch thick, coated, fibrous-glass complying with ASTM C1071 and UL 181.
 - 1) Secure with adhesive.
 - 2) Coat edges exposed to airstream with NFPA 90A approved sealant.
 - 3) Cover liner with non-porous foil.
 - b. Liner not to contain pentabrominated diphenyl ether (CAS #32534-81-9) or octabrominated diphenyl ether.
- D. Damper Assembly:
 1. Heavy-gauge, galvanized steel, or extruded aluminum construction with solid steel, nickel-plated shaft pivoting on HDPE, self-lubricating bearings.
 2. Provide integral position indicator or alternative method for indicating damper position over full range of 90 degrees.
 3. Incorporate low leak damper blades for tight airflow shutoff.
 - a. Air Leakage Past Closed Damper: Maximum two percent of unit maximum airflow at 3 in-wc inlet static pressure, tested in accordance with ASHRAE Std 130.
- E. Electric Heating Coil:
 1. Listed and provided by the terminal unit manufacturer.
 2. Coil Casing: 20 gauge, 0.0359 inch galvanized steel.
 3. Heating Elements: Nickel chrome, supported by ceramic insulators.
 4. Integral Control Panel: NEMA EN 10250, Type 2 enclosure with hinged access door for access to all controls and safety devices.
 5. Furnish a primary automatic reset thermal cutout and differential pressure airflow switch for proof of airflow.
 6. Provide the following additional components, mounted and/or wired within the control enclosure:
 - a. Fused or non-fused door interlocking disconnect switch.
 - b. Mercury contactors.
 - c. Fuse block.
 7. Factory wired, including all limit switches and steps of control as indicated on the equipment schedule, with the SSR (solid-state relay) proportional heat control.
- F. Controls:

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install the inlets of air terminal units and air flow sensors a minimum of four duct diameters from elbows, transitions, and duct takeoffs.
- C. See drawings for the size(s) and duct location(s) of the air terminal units.
- D. Provide ceiling access doors or locate units above easily removable ceiling components.
- E. Support units individually from structure with wire rope complying with ASTM A492 and ASTM A603 in accordance with SMACNA (SRM). See Section 23 0548.
- F. Do not support from ductwork.
- G. Connect to ductwork in accordance with Section 23 3100.

3.02 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals for closeout submittals.

END OF SECTION

SECTION 23 3700 AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Diffusers
 - 1. Perforated ceiling diffusers.
- B. Registers/grilles
 - 1. Ceiling-mounted, egg crate exhaust and return register/grilles.
 - 2. Ceiling-mounted, exhaust and return register/grilles.
 - 3. Ceiling-mounted, supply register/grilles.
 - 4. Wall-mounted, exhaust and return register/grilles.
- C. Duct-mounted supply and return registers/louvers.
- D. Louvers:

1.02 RELATED REQUIREMENTS

- A. Section 09 9123 - Interior Painting: Painting of ducts visible behind outlets and inlets.

1.03 REFERENCE STANDARDS

- A. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.05 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hart & Cooley, Inc: www.hartandcooley.com.
- B. Krueger-HVAC: www.krueger-hvac.com.
- C. Price Industries: www.price-hvac.com.
- D. Ruskin Company: www.ruskin.com.
- E. Titus: www.titus-hvac.com.
- F. Tuttle and Bailey: www.tuttleandbailey.com.
- G. Nailor: www.nailor.com.
- H. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORATED FACE CEILING DIFFUSERS

- A. Type: Perforated face with fully adjustable pattern and removable face.
- B. Frame: Lay-in type.
- C. Fabrication: Steel with steel frame and baked enamel finish.
- D. Color: white.

2.03 DUCT-MOUNTED SUPPLY AND RETURN REGISTERS/LOUVERS

- A. Type: Duct-mounted, rectangular register for round-spiral duct with adjustable pivot-ended blades, end caps, built-in volume damper, and dual cover flanges to lay flush on duct surface regardless of diameter. Performance to match manufacturer's catalog data.

2.04 CEILING SUPPLY REGISTERS/GRILLES

- A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, two-way deflection.
- B. Frame: 1 inch margin with concealed mounting and gasket.
- C. Construction: Made of aluminum extrusions with factory enamel finish.
- D. Color: white.

SECTION 23 3700 AIR OUTLETS AND INLETS

2.05 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

- A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, horizontal face.
- B. Frame: 1 inch margin with concealed mounting.
- C. Fabrication: Steel with 20 gauge, 0.0359 inch minimum frames and 22 gauge, 0.0299 inch minimum blades, steel and aluminum with 20 gauge, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.
- D. Color: white.

2.06 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

- A. Type: Egg crate style face consisting of 1/2 by 1/2 by 1/2 inch grid core.
- B. Fabrication: Grid core consists of aluminum with mill aluminum finish.
- C. Frame: 1 inch margin with concealed mounting.
- D. Frame: Channel lay-in frame for suspended grid ceilings.

2.07 WALL EXHAUST AND RETURN REGISTERS/GRILLES

- A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, horizontal face.
- B. Frame: 1 inch margin with concealed mounting.
- C. Fabrication: Steel frames and blades, with factory baked enamel finish.
- D. Color: As indicated on the drawings.

2.08 LOUVERS

- A. Manufacturers:
 - 1. NCA, a brand of Metal Industries Inc: www.ncamfg.com.
 - 2. Ruskin Company: www.ruskin.com.
 - 3. Greenheck; www.greenheck.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Type: 6 inch deep frame with drainable blades, heavy channel frame, 1/2 inch square mesh screen over intake or exhaust end.
- C. Fabrication: 16 gauge, 0.0598 inch (1.52 mm) thick galvanized steel thick galvanized steel welded assembly, with factory prime coat finish.
- D. Color: To be selected by Architect from manufacturer's full range.
- E. Mounting: Furnish with interior flat flange for installation.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black, see Section 09 9123.
- F. Diffusers and grilles mounted on side of duct shall be connected with a standoff so that it does not reduce free area of duct.

3.02 PROTECTION

- A. Protect installed products until completion of project.
- B. Replace, repair, or touch-up damaged products before Substantial Completion.

END OF SECTION

SECTION 23 5533 FUEL-FIRED UNIT HEATERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Gas fired unit heaters.

1.02 RELATED REQUIREMENTS

- A. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. ASHRAE Std 103 - Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; 2022, with Errata (2025).
- C. NFPA 54 - National Fuel Gas Code; 2024.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- E. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; 2024.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturers warranty for heat exchangers.

PART 2 PRODUCTS

2.01 GAS FIRED UNIT HEATERS

- A. Manufacturers:
 - 1. Modine Manufacturing Company: www.modine.com.
 - 2. Sterling HVAC/Mestek Technology, Inc: www.sterlinghvac.com.
 - 3. Reznor/Thomas & Betts Corporation: www.reznorhvac.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Unit Heaters: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heat exchanger, burner, controls, and accessories:
 - 1. Heating: Natural gas fired.
 - 2. Discharge Louvers: Individually adjustable horizontal and vertical louvers to match cabinet finish.
 - 3. Air Filters: Filter cabinet with 2 inch thick glass fiber, disposable type filters.
- C. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors, glass fiber insulation and reflective liner.
- D. Supply Fan: Propeller type with direct drive, variable pitch motor pulley.
- E. Heat Exchanger: Aluminized steel welded construction.
- F. Gas Burner:
 - 1. Atmospheric type with adjustable combustion air supply.
 - 2. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
 - 3. Electronic pilot ignition, with electric spark igniter.
- G. Gas Burner Safety Controls:
 - 1. Thermocouple Sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
 - 2. Flame Rollout Switch: Installed on burner box and prevents operation.

SECTION 23 5533 FUEL-FIRED UNIT HEATERS

3. Vent Safety Shutoff Sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
 4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.
- H. Operating Controls:
1. Room Thermostat: Cycles burner to maintain room temperature setting.
- I. Requirements:
1. Equipped with intermittent ignition device.
 2. Equipped with power venting.
- J. Performance:
1. Ratings: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of ASHRAE Std 90.1 I-P; seasonal efficiency to ASHRAE Std 103.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that space is ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available.
- C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

- A. Install in accordance with NFPA 90A.
- B. Install gas fired units in accordance with NFPA 54 and applicable codes.
- C. Provide vent connections in accordance with NFPA 211. Refer to Section 23 5100.
- D. Install unit heaters with vibration isolation. Refer to Section 23 0548.
- E. Provide operating controls; refer to Section 23 0913.
- F. Provide connection to electrical power systems; refer to Section 26 0583.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air-source heat pumps.
- B. Air cooled condensing units.
- C. Indoor air handling (fan and coil) units for ducted systems.
- D. Indoor air handling (fan and coil) units for ductless systems.
- E. Controls.

1.02 REFERENCE STANDARDS

- A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2026.
- B. AHRI 270 (SI/I-P) - Sound Performance Rating of Outdoor Unitary Equipment; 2025.
- C. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.
- D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2026).
- E. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.
- F. ASHRAE Std 23.1 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Pressures of the Refrigerant; 2019.
- G. NEMA MG 00001 - Motors and Generators; 2024.
- H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- I. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- J. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Filters: One for each unit.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and approved by manufacturer.

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Carrier Corporation: www.carrier.com/#sle.
- B. Trane Inc: www.trane.com/#sle.
- C. Daikin: www.northamerica-daikin.com.
- D. Mitsubishi: www.mitsubishicomfort.com.
- E. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SYSTEM DESIGN

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
 - 1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator; auxiliary electric heat.
 - 2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B. Performance Requirements: See Schedule for all requirements.

2.03 INDOOR AIR HANDLING UNITS FOR DUCTED SYSTEMS

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
 - 1. Air Flow Configuration: Horizontal.
 - 2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
- B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
 - 1. Motor: NEMA MG 1; 1750 rpm two-speed, permanently lubricated, hinge mounted.
- C. Air Filters: 1 inch thick urethane, washable type arranged for easy replacement.
- D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
 - 1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
 - 2. Manufacturers: System manufacturer.

2.04 INDOOR AIR HANDLING UNITS FOR DUCTLESS SYSTEMS

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
 - 1. Location: Ceiling.
 - 2. Cabinet: Galvanized steel.
 - a. Finish: White.
 - 3. Fan: Line-flow fan direct driven by a single motor.
 - 4. Filter return air with washable, antioxidant pre-filter and a pleated anti-allergy enzyme filter.
- B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
 - 1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
 - 2. Manufacturer: System manufacturer.

2.05 OUTDOOR UNITS

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
 - 1. Comply with AHRI 210/240.
 - 2. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.
 - 3. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
 - 4. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.
 - 5. Sound Rating: 69 dBA, when measured in accordance with AHRI 270 (SI/I-P).
- B. Compressor: Hermetic, two speed 1800 and 3600 rpm, AHRI 520 resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high-pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.

SECTION 23 8126.13 SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

- C. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
 - 1. Condenser Fans: Direct-drive propeller type.
 - 2. Condenser Fan Motor: Enclosed, 1-phase type, permanently lubricated.
- D. Coil: Air-cooled, aluminum fins bonded to copper tubes.
- E. Accessories: Filter drier, high-pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
 - 1. Provide thermostatic expansion valves.
- F. Operating Controls:
 - 1. Control by room thermostat to maintain room temperature setting.
 - 2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig and off when pressure drops below 140 psig for operation to -10 degrees F.
- G. Mounting Pad: Precast concrete parking bumpers, minimum 4 inches square; minimum of two located under cabinet feet.

2.06 ACCESSORY EQUIPMENT

- A. Room Thermostat: Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
 - 1. System selector switch (heat-off-cool) and fan control switch (auto-on).
 - 2. Automatic switching from heating to cooling.
 - 3. Preferential rate control to minimize overshoot and deviation from setpoint.
 - 4. Set-up for four separate temperatures per day.
 - 5. Instant override of setpoint for continuous or timed period from one hour to 31 days.
 - 6. Short cycle protection.
 - 7. Programming based on weekdays, Saturday and Sunday.
 - 8. Selection features including degree F or degree C display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.
 - 9. Battery replacement without program loss.
 - 10. Thermostat Display:
 - a. Time of day.
 - b. Actual room temperature.
 - c. Programmed temperature.
 - d. Programmed time.
 - e. Duration of timed override.
 - f. Day of week.
 - g. System Mode Indication: Heating, Cooling, Fan Auto, Off, and On, Auto or On, Off.
- B. Provide crankcase heater.
- C. Provide wind baffle.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and in correct location.
- C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
- B. Install in accordance with NFPA 90A and NFPA 90B.
- C. Install refrigeration systems in accordance with ASHRAE Std 15.
- D. Pipe drain from cooling coils to nearest floor drain.
- E. Install on supports as described on drawings and in Section 23 0529 - Hangers and Supports for HVAC Piping and Equipment.

END OF SECTION

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SECTION 26 0505 SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical demolition.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as indicated.
- B. Demolition drawings are based on casual field observation and existing record documents.
- C. Report discrepancies to Architect before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
 - 2. Make temporary connections to maintain service in areas adjacent to work area.
- E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Notify Owner before partially or completely disabling system.
 - 2. Make notifications at least 24 hours in advance.
 - 3. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- F. Repair adjacent construction and finishes damaged during demolition and extension work.
- G. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

3.04 CLEANING AND REPAIR

- A. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.
- B. Clean and repair existing materials and equipment that remain or that are to be reused.
- C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

SECTION 26 0505 SELECTIVE DEMOLITION FOR ELECTRICAL

- D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Nonmetallic-sheathed cable.
- C. Wiring connectors.
- D. Electrical tape.
- E. Wire pulling lubricant.
- F. Cable ties.
- G. Firestop sleeves.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 26 0505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.
- C. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 28 4600 - Fire Detection and Alarm: Fire alarm system conductors and cables.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2024).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.
- 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; 2024.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- K. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- L. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.
- M. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- N. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- O. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- P. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

SECTION 26 0519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

1.05 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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, 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.
- C. Metal-clad cable is not permitted.
 - 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - 1) Maximum Length: 6 feet.

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. Minimum Conductor Size:
 - 1. Branch Circuits: 12 AWG.
- I. 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. 480Y/277 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Neutral/Grounded: Gray.
 - b. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.

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- 2) Phase B: Red.
- 3) Phase C: Blue.
- 4) Neutral/Grounded: White.
- c. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
 1. Copper Building Wire:
 - a. Cerro Wire LLC: www.cerrowire.com/#sle.
 - b. Encore Wire Corporation: www.encorewire.com/#sle.
 - c. General Cable Technologies Corporation: www.generalcable.com/#sle.
 - d. Service Wire Co: www.servicewire.com/#sle.
 - e. Southwire Company: www.southwire.com/#sle.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

2.04 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.
- B. Connectors for Grounding and Bonding: Comply with Section 26 0526.
- C. Wiring Connectors for Splices and Taps:
 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- E. Mechanical Connectors: Provide bolted type or set-screw type.
- F. Compression Connectors: Provide circumferential type or hex type crimp configuration.

2.05 ACCESSORIES

- A. Electrical Tape:
 1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.
 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
- B. 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.
- C. Cable Ties: Material and tensile strength rating suitable for application.
 1. Manufacturers:
- D. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
 1. Products:

SECTION 26 0519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

- a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.
- E. Fire-Protective Coating for Electrical Conductors and Cables: Field-applied, intumescent or ablative coating designed to prevent ignition and propagation of fire along thermoplastic-insulated conductors and cables.

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. When circuit destination is indicated without specific routing, determine exact routing required.
 - 3. Arrange circuiting to minimize splices.
 - 4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
 - 5. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 - 6. 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.
 - a. Branch circuits fed from ground fault circuit interrupter (GFCI) circuit breakers.
 - b. Branch circuits fed from feed-through protection of GFI receptacles.
 - c. Branch circuits with dimming controls.
 - d. Branch circuits with isolated grounding conductor.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. 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.
- E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- F. 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.
- G. Install conductors with a minimum of 12 inches of slack at each outlet.
- H. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- I. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

SECTION 26 0519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

- J. 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.
 - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- K. 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.
- L. Insulate ends of spare conductors using vinyl insulating electrical tape.
- M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- N. 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 4000 - 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 0526 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.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- 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.
 - 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 3000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

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.

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. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.

SECTION 26 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

3. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
4. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
5. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

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 0526:
 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.

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 0553.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - 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.

SECTION 26 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

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SECTION 26 0529 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 3000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- C. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- D. Section 27 0529 - 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; 2024.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- 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; 2023.
- 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 3000.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

1.06 QUALITY ASSURANCE

- A. Maintain at project site one copy of each referenced document that prescribes execution requirements.

1.07 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.

SECTION 26 0529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

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. Manufacturers:
 - a. ABB: www.electrification.us.abb.com/#sle.
 - b. Eaton Corporation: www.eaton.com/#sle.
 - c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
 - d. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
 2. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 3. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
1. Manufacturers:
 - a. ABB: www.electrification.us.abb.com/#sle.
 - b. Eaton Corporation: www.eaton.com/#sle.
 - c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
 - d. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
- D. Metal Channel/Strut Framing Systems:
1. Manufacturers:
 - a. ABB: www.electrification.us.abb.com/#sle.
 - b. Atkore International Inc; Unistrut: www.unistrut.us/#sle.
 2. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
 3. Comply with MFMA-4.
- E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
- F. Anchors and Fasteners:
1. Manufacturers - Mechanical Anchors:
 - a. Dewalt: anchors.dewalt.com/#sle.
 - b. Hilti, Inc: www.hilti.com/#sle.
 - c. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com/#sle.
 - d. MKT Fastening: www.mktfasteningusa.com/#sle.
 - e. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.
 2. 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.

SECTION 26 0529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

- 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 4000 - 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 0533.13 CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Stainless steel rigid metal conduit (RMC).
- C. Galvanized steel intermediate metal conduit (IMC).
- D. Stainless steel intermediate metal conduit (IMC).
- E. Galvanized steel electrical metallic tubing (EMT).
- F. Stainless steel electrical metallic tubing (EMT).
- G. Aluminum electrical metallic tubing (EMT).
- H. Rigid polyvinyl chloride (PVC) conduit.
- I. Electrical nonmetallic tubing (ENT).

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.
- C. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- D. Section 26 0529 - Hangers and Supports for Electrical Systems.
- E. Section 26 0533.16 - Boxes for Electrical Systems.
- F. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2025.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2025.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2025.
- G. NEMA BI 50058 - Electrical Nonmetallic Tubing (ENT); 2014 (Reaffirmed 2019).
- H. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- M. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; 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 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- S. UL 1653 - Electrical Nonmetallic Tubing; Current Edition, Including All Revisions.

SECTION 26 0533.13 CONDUIT FOR ELECTRICAL SYSTEMS

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 SUBMITTALS

- A. See Section 01 3000 - 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. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.

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, 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. 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).

2.02 CONDUIT - GENERAL REQUIREMENTS

- A. Comply with NFPA 70.
- 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 raceway system.
- D. Provide products listed, classified, and labeled as suitable for purpose intended.
- E. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 3/4-inch trade size.
 - 2. Branch Circuit Homeruns: 3/4-inch trade size.
- F. 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. Manufacturers:
 - 1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
 - 2. Nucor Tubular Products: www.nucortubular.com/#sle.
 - 3. Rymco USA: www.rymcousa.com/#sle.

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4. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
 5. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
1. Manufacturers:
 - a. ABB; T&B: www.electrification.us.abb.com/#sle.
 - b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
 - c. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
 - d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
 2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
 3. Material: Use steel or malleable iron.
 4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 STAINLESS STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
1. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
 2. Gibson Stainless & Specialty Inc: www.gibsonstainless.com/#sle.
 3. Patriot Industries, a division of Patriot Aluminum Products LLC: www.patriotsas.com/#sle.
 4. Rymco USA: www.rymcousa.com/#sle.
- B. Description: NFPA 70, Type RMC stainless steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6A.
- C. Fittings:
1. Manufacturers:
 - a. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
 - b. Eaton: www.eaton.com/#sle.
 - c. Gibson Stainless & Specialty Inc: www.gibsonstainless.com/#sle.
 - d. Patriot Industries, a division of Patriot Aluminum Products LLC: www.patriotsas.com/#sle.
 2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
 3. Material: Use stainless steel with corrosion resistance equivalent to conduit.
 4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.05 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

- A. Manufacturers:
1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
 2. Nucor Tubular Products: www.nucortubular.com/#sle.
 3. Rymco USA: www.rymcousa.com/#sle.
 4. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
 5. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
- B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- C. Fittings:
1. Manufacturers:
 - a. ABB; T&B: www.electrification.us.abb.com/#sle.
 - b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
 - c. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
 - d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
 2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
 3. Material: Use steel or malleable iron.

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4. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.06 STAINLESS STEEL INTERMEDIATE METAL CONDUIT (IMC)

- A. Manufacturers:
 1. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
- B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- C. Fittings:
 1. Manufacturers:
 - a. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
 - b. Eaton: www.eaton.com/#sle.
 2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.

2.07 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
 1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
 2. Nucor Tubular Products: www.nucortubular/#sle.
 3. Rymco USA: www.rymcousa.com/#sle.
 4. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
 5. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.
- B. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Fittings:
 1. Manufacturers:
 - a. ABB; T&B: www.electrification.us.abb.com/#sle.
 - b. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.us/#sle.
 - c. Bridgeport Fittings, LLC: www.bptfittings.com/#sle.
 - d. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Material: Use steel or malleable iron.
 4. Connectors and Couplings: Use compression/gland or set-screw type.
 - a. Do not use indenter type connectors and couplings.

2.08 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
 1. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
- B. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.
- C. Fittings:
 1. Manufacturers:
 - a. Calbrite, a division of Atkore International: www.calbrite.com/#sle.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Connectors and Couplings: Use compression/gland or set-screw type.

2.09 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Manufacturers:
 1. ABB; Carlon: www.carlon.com/#sle.
 2. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
 3. Cantex Inc: www.cantexinc.com/#sle.
 4. Heritage Plastics, a division of Atkore International: www.heritageplastics.com/#sle.
 5. JM Eagle: www.jmeagle.com/#sle.
 6. Rymco USA: www.rymcousa.com/#sle.

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- B. 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.
- C. 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.

2.10 ELECTRICAL NONMETALLIC TUBING (ENT)

- A. Manufacturers:
 - 1. ABB; Carlon: www.electrification.us.abb.com/#sle.
 - 2. Cantex Inc: www.cantexinc.com/#sle.
 - 3. IPEX, a division of Aliaxis: ww.ipexna.com/#sle.
- B. Description: NFPA 70, Type ENT electrical nonmetallic tubing complying with NEMA BI 50058 and listed and labeled as complying with UL 1653.
- C. 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.

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. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.
- D. Intermediate Metal Conduit (IMC): Install in accordance with NECA 101.
- E. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.
- F. Electrical Nonmetallic Tubing (ENT): Install in accordance with NECA 111.
- G. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. 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.
 - 4. Unless otherwise approved, do not route exposed conduits:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - d. Across building exterior surfaces.
- H. 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 0529.
 - 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- I. Connections and Terminations:

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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. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
5. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
6. 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 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 8400.

K. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors 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. Conduit Sealing:

1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
 - a. Where conduits enter building from outside.
 - b. Where service conduits enter building from underground distribution system.
 - c. Where conduits enter building from underground.
 - d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
 - a. Where conduits pass from outdoors into conditioned interior spaces.
 - b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

M. Provide grounding and bonding; see Section 26 0526.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - 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.

SECTION 26 0533.13 CONDUIT FOR ELECTRICAL SYSTEMS

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

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SECTION 26 0533.16 BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

1.02 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0533.13 - Conduit for Electrical Systems:
 - 1. Conduit bodies and other fittings.
- D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26 2726 - Wiring Devices:
 - 1. Wall plates.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- 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. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- J. UL 514A - Metallic Outlet Boxes; 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 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

SECTION 26 0533.16 BOXES FOR ELECTRICAL SYSTEMS

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.

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.

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, 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 2726.
 - 13. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
 - b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com/#sle.
 - c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com/#sle.
 - d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - e. Thomas & Betts Corporation: www.tnb.com/#sle.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
 - 1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 - 2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:
 - a. Indoor Clean, Dry Locations: Type 1, painted steel.
 - 3. Junction and Pull Boxes Larger Than 100 cubic inches:
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
 - 4. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.

SECTION 26 0533.16 BOXES FOR ELECTRICAL SYSTEMS

- b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.
- c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com/#sle.

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. Box Supports:
 - 1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 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.
- E. Install boxes plumb and level.
- F. 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 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 at the edge of the box.
- G. Install boxes as required to preserve insulation integrity.
- H. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- I. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- J. Close unused box openings.
- K. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- L. Provide grounding and bonding in accordance with Section 26 0526.

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 0553 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. Warning signs and labels.

1.02 RELATED REQUIREMENTS

- A. Section 26 2726 - Wiring Devices: Device and wallplate finishes; factory pre-marked wallplates.

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.
 - a. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
 - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - 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. Identification for Conductors and Cables:
 - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
 - 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.

SECTION 26 0553 IDENTIFICATION FOR ELECTRICAL SYSTEMS

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 - 1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - 2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
 - 3. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.
- B. Identification Labels:
 - 1. Manufacturers:
 - a. Brady Corporation: www.bradyid.com/#sle.
 - b. Brother International Corporation: www.brother-usa.com/#sle.
 - c. Panduit Corp: www.panduit.com/#sle.
 - 2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - 3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

2.03 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 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 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. Branch Devices: Adjacent to device.
 - 6. Interior Components: Legible from the point of access.
 - 7. Conductors and Cables: Legible from the point of access.
- 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.

END OF SECTION

SECTION 26 0583 WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

- A. Section 26 2726 - Wiring Devices.

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 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. 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 MATERIALS

- A. Disconnect Switches: As specified in Section 26 2816.16 and in individual equipment sections.
- B. Wiring Devices: As specified in Section 26 2726.
- C. Flexible Conduit: As specified in Section 26 0533.13.
- D. Wire and Cable: As specified in Section 26 0519.
- E. Boxes: As specified in Section 26 0533.16.

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.

SECTION 26 0583 WIRING CONNECTIONS

- 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 0923 LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Occupancy sensors.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- C. Section 26 0529 - Hangers and Supports for Electrical Systems
- D. Section 26 0533.16 - Boxes for Electrical Systems.
- E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches and wall dimmers.
- G. Section 26 5100 - Interior Lighting.
- H. Section 28 4600 - Fire Detection and Alarm.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate placement of lighting control devices with millwork, furniture, equipment and other potential conflicts.
 - 2. Coordinate placement of wall switch occupancy sensors with installed door swings.
 - 3. Coordinate placement of occupancy sensors with millwork, furniture, equipment and other potential obstructions to motion detection coverage.
 - 4. Coordinate lighting control device product selections with luminaire characteristics; see Section 26 5100 and lighting fixture schedule.
 - 5. Notify Architect of 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 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, operating modes or sequence of functions, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
 - 1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.
- C. Field quality control reports.
- D. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

- A. Comply with NFPA 70.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store products in 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.

SECTION 26 0923 LIGHTING CONTROL DEVICES

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for purpose intended.
- B. Unless specifically indicated as excluded, provide components necessary for complete operating system including, but not limited to, conduit, wiring, connectors, hardware, and accessories.

2.02 OCCUPANCY SENSORS

- A. Manufacturers:
 - 1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
 - 2. Hubbell Incorporated: www.hubbell.com/#sle.
 - 3. Intermatic, Inc: www.intermatic.com/#sle.
 - 4. Legrand North America, Inc: www.legrand.us/#sle.
 - 5. Lutron Electronics Company, Inc: www.lutron.com/#sle.
 - 6. RAB Lighting, Inc: www.rablighting.com/#sle.
- B. General Requirements:
 - 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 (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
 - b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
 - c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and ultrasonic technologies.
 - d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and audible sound sensing 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 adjustable turn-off delay time interval.
 - 5. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
 - 6. 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.
- C. Wall Switch Occupancy Sensors:
 - 1. General Requirements:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
 - b. 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 delayed-off time interval.
 - 2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within area of 900 square feet.
 - 3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within area of 400 square feet.
 - 4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within area of 900 square feet.
- D. Wall Dimmer Occupancy Sensors:
 - 1. General Requirements:

SECTION 26 0923 LIGHTING CONTROL DEVICES

- a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.
- b. 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.
2. Passive Infrared (PIR) Wall Dimmer Occupancy Sensors: Capable of detecting motion within area of 900 square feet.
- E. Ceiling Mounted Occupancy Sensors:
 1. General Requirements:
 - a. Description: Low profile occupancy sensors designed for ceiling installation.
 2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet at mounting height of 9 feet, with field of view of 360 degrees.
 3. Ultrasonic Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within area of 500 square feet at mounting height of 9 feet, with field of view of 360 degrees.
 - b. Medium Range Sensors: Capable of detecting motion within area of 1,000 square feet at mounting height of 9 feet, with field of view of 360 degrees.
 - c. Extended Range Sensors: Capable of detecting motion within area of 2,000 square feet at mounting height of 9 feet.
 4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet at mounting height of 9 feet, with field of view of 360 degrees.
 - b. Extended Range Sensors: Capable of detecting motion within area of 1,200 square feet at mounting height of 9 feet, with field of view of 360 degrees.
 5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:
 - a. Extended Range Sensors: Capable of detecting motion within area of 1,200 square feet at mounting height of 9 feet.
- F. Directional Occupancy Sensors:
 1. General Requirements:
 - a. Description: Occupancy sensors designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
- G. 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 associated wiring and accessories as required to control load indicated on drawings.
 3. Input Supply Voltage: Dual rated for 120/277 V ac.

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 service voltage and ratings of lighting control devices are appropriate for service voltage and load requirements at location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

SECTION 26 0923 LIGHTING CONTROL DEVICES

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. 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 as required for installation of lighting control devices; see Section 26 0533.16.
 - 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switch Occupancy Sensors: 48 inches above finished floor.
- C. Maintain separation of remote-control, signaling, and power-limited circuits.
 - 1. See manufacturer instructions and Section 26 0519 for control wiring conductors, wiring methods, and identification requirements.
- D. Install lighting control devices in accordance with manufacturer's instructions.
- E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- F. Install lighting control devices plumb and level, and held securely in place.
- G. Where required and not furnished with lighting control device, provide wall plate; see Section 26 2726.
- H. Provide required supports; see Section 26 0529.
- I. 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.
- J. Occupancy Sensor Locations:
 - 1. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - 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. Correct wiring deficiencies and replace damaged or defective conductors, cables, and lighting control devices.

3.05 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. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
- E. 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.

SECTION 26 0923 LIGHTING CONTROL DEVICES

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

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SECTION 26 2726 WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Wall plates and covers.
- E. Floor box service fittings.

1.02 RELATED REQUIREMENTS

- A. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- B. Section 26 0583 - Wiring Connections: Cords and plugs for equipment.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- 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 1472 - Solid-State Dimming 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. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
- B. Sequencing:
 - 1. Do not install wiring devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- C. Operation and Maintenance Data:
 - 1. Wall Dimmers: Include information on operation and setting of presets.
 - 2. GFCI Receptacles: Include information on status indicators.
- D. Project Record Documents: Record actual installed locations of wiring devices.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.

SECTION 26 2726 WIRING DEVICES

2. Screwdrivers for Tamper-Resistant Screws: Two for each type of screw.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Products: Listed, classified, and labeled as suitable for the purpose intended.

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 DEVICES - GENERAL REQUIREMENTS

- A. Provide wiring devices suitable for intended use with ratings adequate for load served.
- B. Wiring Device Applications:
 1. Receptacles Installed Outdoors or in Damp or Wet Locations: Use weather-resistant GFCI receptacles with weatherproof covers.
 2. Provide GFCI protection for:
 - a. Receptacles installed within 6 feet of sinks.
 - b. Receptacles installed in kitchens.
 - c. Receptacles serving electric drinking fountains.
- C. Wiring Device Finishes:
 1. Provide wiring device finishes as described below, unless otherwise indicated.
 2. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.
 3. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.
 4. Wiring Devices Installed in Wet or Damp Locations: White with weatherproof cover.
 5. Wiring Devices Connected to Emergency Power: Red with red nylon wall plate.

2.02 WALL SWITCHES

- A. Manufacturers:
 1. Hubbell Incorporated: www.hubbell.com/#sle.
 2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
- B. 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.
- C. Standard Wall Switches: Commercial 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.

2.03 WALL DIMMERS

- A. 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.

2.04 RECEPTACLES

- A. Manufacturers:
 1. Hubbell Incorporated: www.hubbell.com/#sle.
 2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
- B. 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.

SECTION 26 2726 WIRING DEVICES

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. Weather Resistant Convenience Receptacles: Commercial 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.
- D. GFCI Receptacles:
 1. 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: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R.
 3. Weather Resistant GFCI Receptacles: Commercial specification grade, duplex, 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.

2.05 WALL PLATES AND COVERS

- A. Manufacturers:
 1. Hubbell Incorporated: www.hubbell-wiring.com/#sle.
 2. Intermatic, Inc: www.intermatic.com/#sle.
 3. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 4. Lutron Electronics Company, Inc: www.lutron.com/#sle.
 5. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
- 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. Weatherproof Receptacle 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.

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 0533.16 as required for installation of wiring devices provided under this section.
 1. Mounting Heights: Unless otherwise indicated, as follows:

SECTION 26 2726 WIRING DEVICES

- a. Wall Switches: 48 inches above finished floor.
 - b. Wall Dimmers: 48 inches above finished floor.
 - c. Receptacles: 18 inches above finished floor or 6 inches above counter.
2. 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.
 3. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
- 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 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. Install wiring devices plumb and level with mounting yoke held rigidly in place.
 - I. Install wall switches with OFF position down.
 - J. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
 - K. Do not share neutral conductor on branch circuits utilizing wall dimmers.
 - L. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
 - M. 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.
 - N. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - 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. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect.

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 2816.16 ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- C. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).
- D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- 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 3000 - 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.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- 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 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.

SECTION 26 2816.16 ENCLOSED SWITCHES

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of enclosed switches.

PART 2 PRODUCTS

2.01 ENCLOSED SAFETY SWITCHES

- A. Manufacturers:
 - 1. ABB: www.electrification.us.abb.com/#sle.
 - 2. Eaton Corporation: www.eaton.com/#sle.
 - 3. Schneider Electric: www.se.com/#sle.
 - 4. Siemens Industry, Inc: www.siemens.com/#sle.
 - 5. Source Limitations: Furnish products produced by same manufacturer as other electrical distribution equipment for project and obtained from single supplier.
- B. 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.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet.
 - 2. Ambient Temperature: Between -22 degrees F and 104 degrees F.
- E. Horsepower Rating: Suitable for connected load.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Short Circuit Current Rating:
- H. Provide with switch blade contact position that is visible when the cover is open.
- I. Conductor Terminations: Suitable for use with the conductors to be installed.
- J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- K. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
- L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- M. Heavy Duty Switches:
 - 1. Comply with NEMA BS 31047.
 - 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.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- 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. 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 0529.

SECTION 26 2816.16 ENCLOSED SWITCHES

- 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 above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 0526.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - 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.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 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 5100 INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.

1.02 RELATED REQUIREMENTS

- A. Section 26 0529 - Hangers and Supports for Electrical Systems.
- B. Section 26 0533.16 - Boxes for Electrical Systems.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 0923 - Lighting Control Devices.
- E. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.

1.03 REFERENCE STANDARDS

- A. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- B. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2025.
- C. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- D. 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 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 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
- C. 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.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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.

SECTION 26 5100 INTERIOR LIGHTING

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

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 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 0533.16 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 0529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Suspended Ceiling Mounted Luminaires:
 - 1. Do not use ceiling tiles to bear weight of luminaires.
 - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
 - 3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
 - 4. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- G. Recessed Luminaires:
 - 1. Install trims tight to mounting surface with no visible light leakage.
 - 2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
 - 3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- H. Suspended Luminaires:
 - 1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
 - 2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
 - 3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet between supports.
- I. Install accessories furnished with each luminaire.
- J. Bond products and metal accessories to branch circuit equipment grounding conductor.
- K. Emergency Lighting Units:
- L. Exit Signs:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- M. Install lamps in each luminaire.

SECTION 26 5100 INTERIOR LIGHTING

- N. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - 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 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.

3.04 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. 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.

3.05 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.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.
- B. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.
- C. Just prior to Substantial Completion, replace all lamps that have failed.

3.07 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION